Florida Department of Education

CTE Curriculum Frameworks

Architecture & Construction

Rule 6A-6.0571, F.A.C.
Effective May 2025

Florida Department of Education
Curriculum Framework

Program Title: **Architectural Drafting**
Program Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

Secondary – Career Preparatory	
Program Number	8101100
CIP Number	0615130111
Grade Level	9-12
Program Length	6 Credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3011 -- Architectural and Civil Drafters
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 or advanced training in the architectural drafting industry and related fields.

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 freehand sketching, drafting by hand and computer and 3D modeling specific to architectural drafting.

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 totaling six credits. The four courses, Drafting 1, 2, 3, 4, are considered core courses for the other secondary Drafting programs.

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

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8725010	Drafting 1	BLDG CONSTR @7 7G DRAFTING @7 7G TEC DRAFT 7G TEC CONSTR @7 7G	1 Credit	17-3011	3	CT
8725020	Drafting 2		1 Credit		3	CT
8725030	Drafting 3		1 Credit		3	CT
8725040	Drafting 4		1 Credit		3	CT
8725450	Architectural Drafting 5		1 Credit		3	CT
8725460	Architectural Drafting 6		1 Credit		3	CT

(Graduation Requirement Codes: CT= Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA= Mathematics, PL= Personal Financial Literacy)

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Apply basic drafting, sketching and Computer-Aided Drawing (CAD) techniques and skills.
02.0 Apply the design procedures.
03.0 Design and prepare multi-view drawings using 2D sketching and/or CAD software.
04.0 Prepare sectional views using 2D sketching and/or CAD software.
05.0 Prepare auxiliary drawings using 2D sketching and/or CAD software.
06.0 Apply basic dimensioning and annotation using 2D sketching and/or CAD software.
07.0 Prepare working drawings.
08.0 Prepare pictorial drawings using 2D sketching and/or CAD software.
09.0 Prepare surface developments (optional).
10.0 Perform basic computer-aided drafting functions using CAD software.
11.0 Apply three-dimensional modeling concepts using CAD software.
12.0 Design and prepare basic architectural drawings using 2D sketching and/or CAD software.
13.0 Demonstrate an understanding of basic civil drawings.
14.0 Perform computer-aided drafting functions using 3D modeling software to create an architectural model or other type of model.
15.0 Describe the importance of professional ethics and legal responsibilities in the design and construction industry.
16.0 Prepare computer-aided three-dimensional architectural drawings.
17.0 Research the history of the built environment.
18.0 Investigate sustainability issues related to the design, construction and maintenance of the built environment.
19.0 Examine career opportunities in drafting and related fields to determine requisite skills, qualifications, supply and demand, market location and potential earnings.
20.0 Design and draft computer-aided architectural multi-level residential drawings.
21.0 Prepare a detailed computer-aided site plan drawing.
22.0 Design and draft a basic computer-aided landscape plan drawing.
23.0 Prepare a computer-aided wall section.
24.0 Prepare a detailed computer-aided foundation plan drawing.
25.0 Prepare a detailed computer-aided electrical plan drawing.
26.0 Prepare a detailed computer-aided Heating, Ventilation and Air-Conditioning (HVAC) plan drawing.
27.0 Prepare a detailed computer-aided plumbing plan drawing.
28.0 Design and draft computer-aided architectural drawings for a commercial building.
29.0 Draft detailed computer-aided Mechanical, Electrical and Plumbing (MEP) drawings.
30.0 Prepare presentation drawings.

Florida Department of Education
Student Performance Standards

Course Title: **Drafting 1**
Course Number: **8725010**
Course Credit: **1**

Course Description:

This course provides instruction in basic drawing and drafting skills, applied mathematics, multi-view and sectional drawings.

CTE Standards and Benchmarks	
01.0	Apply basic drafting, sketching and Computer-Aided Drawing (CAD) techniques and skills. The student will be able to:
01.01	Use and maintain drafting equipment, measuring scales, drafting instruments and reproduction equipment.
01.02	Identify and use the various drafting media and techniques.
01.03	Demonstrate the use of the alphabet of lines.
01.04	Prepare title blocks and other drafting formats.
01.05	Use various freehand and other lettering techniques.
01.06	Develop skill in sketching and mark making to plan, execute and construct two-dimensional images or three-dimensional models, including presentation graphics.
01.07	Apply geometric construction techniques.
01.08	Solve geometric, algebraic and trigonometric problems related to drafting.
01.09	Demonstrate care of equipment.
01.10	Apply use of effective and accurate architectural and/or engineering vocabulary throughout design and drafting process.
02.0	Apply the design procedures. The student will be able to:
02.01	Analyze challenges and identify solutions for design problems.
02.02	Investigate the use of space, scale and environmental features to create three-dimensional form, or the illusion of depth and form.
02.03	Analyze and apply data and measurements to solve problems and interpret drawings.
03.0	Design and prepare multi-view drawings using 2D sketching and/or CAD software. The student will be able to:

CTE Standards and Benchmarks	
	03.01 Prepare multi-view scaled drawings.
	03.02 Select proper drawing scale, views and layout.
	03.03 Prepare drawings containing horizontal and vertical surfaces.
	03.04 Prepare drawings containing circles and/or arcs.
	03.05 Prepare removed details and conventional breaks.
04.0	Prepare sectional views using 2D sketching and/or CAD software. The student will be able to:
	04.01 Prepare drawings containing full sections and half sections.
	04.02 Prepare drawings containing offset sections.
	04.03 Prepare drawings containing revolved sections.
	04.04 Prepare drawings containing removed sections and broken-out sections.
	04.05 Prepare a sectional assembly drawing applying material symbols.
05.0	Prepare auxiliary drawings using 2D sketching and/or CAD software. The student will be able to:
	05.01 Prepare drawings containing primary auxiliary views.
	05.02 Prepare drawings containing auxiliary views that include curved lines.
06.0	Apply basic dimensioning and annotation using 2D sketching and/or CAD software. The student will be able to:
	06.01 Prepare drawings containing linear, angular and circular standard dimensions.
	06.02 Prepare drawings using general and local notes.
	06.03 Apply basic tolerance techniques and nominal and actual dimensions.
07.0	Prepare working drawings. The student will be able to:
	07.01 Prepare assembly drawings.
	07.02 Prepare detail drawings.
	07.03 Prepare technical drawings.

CTE Standards and Benchmarks	
	07.04 Modify drawings to include material specifications and parts list.
08.0	Prepare pictorial drawings using 2D sketching and/or CAD software. The student will be able to:
	08.01 Prepare isometric, oblique and other pictorial drawings.
	08.02 Prepare one-point and two-point perspectives.
	08.03 Prepare presentation graphics.
09.0	Prepare surface developments. (optional) The student will be able to:
	09.01 Prepare developments of prisms, cylinders, cones and pyramids.
	09.02 Prepare developments of a transition piece.
	09.03 Prepare drawings involving intersecting pieces.
10.0	Perform basic computer-aided drafting functions using CAD software. The student will be able to:
	10.01 Demonstrate organizational skills to influence the sequential process when creating drawings.
	10.02 Construct geometric figures of lines, splines, circles, arcs, etc., to represent plans and/or mechanical assemblies.
	10.03 Create and edit text using appropriate style and size to annotate drawings.
	10.04 Create and use multi-leaders.
	10.05 Use control accuracy enhancement tools for entity positioning methods such as snap and XYZ.
	10.06 Use editing commands.
	10.07 Use viewing commands to perform zooming and panning.
	10.08 Plot drawings on media using layout and scale.
	10.09 Use query commands to interrogate database for entity characteristics, distance, area and status.
	10.10 Apply standard dimensioning rules.
	10.11 Move, stretch and offset objects.
	10.12 Create a radius between objects.

CTE Standards and Benchmarks	
	10.13 Trim and extend objects.
	10.14 Break and join objects.
	10.15 Create and edit dimensions and work with dimension styles.
	10.16 Change object properties.
	10.17 Crosshatch objects.
	10.18 Apply external references.
	10.19 Isolate and hide objects.
	10.20 Use selection set methods.
	10.21 Use rectangular and polar arrays.
	10.22 Use rotation reference angles.
	10.23 Use elements of creativity and organizational principles to create visually coherent views and layouts.
	10.24 Create and manage layers or levels.
	10.25 Use page setup for plotting.
	10.26 Create, insert and edit reusable content such as symbols and blocks or cells.
	10.27 Use specific line types.
	10.28 Create fills and gradients.
	10.29 Edit hatch patterns and fills.
11.0	Apply three-dimensional modeling concepts using CAD software. The student will be able to:
	11.01 Use coordinate systems to locate objects in three-dimensional space.
	11.02 Use basic geometric shapes available in two-dimensional and three-dimensional modeling software.
	11.03 Define the parameters used for determining size, placement and orientation of a modeling object.
	11.04 Describe the Boolean modeling operations of union, subtraction and intersection.

CTE Standards and Benchmarks	
11.05	Demonstrate extrusion or sweeping techniques that transform two-dimensional objects into three-dimensional objects.
11.06	Describe the ‘revolve’ or ‘lathe’ techniques for animating a two-dimensional object and give examples of their application.
11.07	Use scale, rotate and move actions that comprise the transformation technique for animating a three-dimensional object.
11.08	Use basic viewing navigation tools such as zoom, rotate and panning.
11.09	Work with materials, techniques and processes through practice and perseverance to create desired result in two-dimensional and three-dimensional models.
11.10	Analyze challenges and identify solutions for three-dimensional design problems.
11.11	Investigate the use of space, scale and environmental features within a model to create three-dimensional form or the illusion of depth and form.
11.12	Apply materials, ideas, images and/or equipment from other content areas to generate ideas and processes for the development of three-dimensional models.
11.13	Investigate the use of various technology, software and media design to reflect creative trends in visual culture.

Florida Department of Education
Student Performance Standards

Course Title: **Drafting 2**
Course Number: **8725020**
Course Credit: **1**

Course Description:

This course provides competencies in basic architectural and civil computer-aided drafting and design, as well as an overview of the history of the built environment.

CTE Standards and Benchmarks	
12.0	Design and prepare basic architectural drawings using 2D sketching and/or CAD software. The student will be able to:
12.01	Solve design problems, through convergent and divergent thinking, to gain new perspectives.
12.02	Apply critical thinking and problem solving skills to develop creative solutions for design problems.
12.03	Draw a site plan.
12.04	Draw a floor plan.
12.05	Draw interior and exterior elevations.
12.06	Draw a roof plan.
12.07	Prepare door/window schedules.
12.08	Draw wall sections.
12.09	Draw a plumbing plan. (optional)
12.10	Draw an electrical plan.
12.11	Draw a Heating, Ventilation and Air Conditioning (HVAC) plan. (optional)
12.12	Draw a roof framing plan. (optional)
12.13	Review and revise plans throughout the design process to refine and achieve design objective.
12.14	Demonstrate flexibility and adaptability throughout the design process.

CTE Standards and Benchmarks	
	12.15 Define a basic project materials list.
	12.16 Calculate a basic project quantity take-off.
13.0	Demonstrate an understanding of basic civil drawings. The student will be able to:
	13.01 Apply use of effective and accurate civil terminology throughout the design process.
	13.02 Read and interpret civil drawings.
	13.03 Read and interpret plan and profile drawings.
	13.04 Read and interpret topographic drawings.

Florida Department of Education
Student Performance Standards

Course Title: **Drafting 3**
Course Number: **8725030**
Course Credit: **1**

Course Description:

This course provides instruction in computer-aided drafting skills, professional ethics and career and education planning.

CTE Standards and Benchmarks	
14.0	Perform computer-aided drafting functions using 3D modeling software to create an architectural model or other type of model. The student will be able to:
14.01	Draw lines, arcs, circles, etc. to represent plans and/or mechanical assemblies.
14.02	Create text styles, text justification and multi-line text.
14.03	Create and use multi-leaders.
14.04	Edit dimensions.
14.05	Work with dimension styles.
14.06	Crosshatch objects.
14.07	Apply external references.
14.08	Isolate and hide objects.
14.09	Use selection set methods.
14.10	Use rectangular and polar arrays.
14.11	Use rotation reference angles.
14.12	Use elements of creativity and organizational principles to create visually coherent views and layouts.
14.13	Create and manage layers or levels.
14.14	Use page setup for plotting.
14.15	Create, insert and edit reusable content such as symbols and blocks or cells.

CTE Standards and Benchmarks	
	14.16 Use specific line types.
	14.17 Create fills and gradients.
	14.18 Edit hatch patterns and fills.
15.0	Describe the importance of professional ethics and legal responsibilities in the design and construction industry. The student will be able to:
	15.01 Evaluate and justify decisions based on ethical reasoning.
	15.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities and employer policies.
	15.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
	15.04 Interpret and explain written organizational policies and procedures.
	15.05 Demonstrate personal responsibility, ethics and integrity, including respect for intellectual property, when accessing information and creating design projects.

Florida Department of Education
Student Performance Standards

Course Title: **Drafting 4**
Course Number: **8725040**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in three-dimensional modeling and sustainability issues related to the design, construction and maintenance of the built environment.

CTE Standards and Benchmarks	
16.0	Prepare computer-aided three-dimensional architectural drawings. The student will be able to:
16.01	Use technology to facilitate creative process and techniques.
16.02	Investigate the use of various technologies and resources to inspire creative design
16.03	Compare and analyze traditional and digital media to learn how technology has altered opportunities for innovative responses and results.
16.04	Draw plans and elevations.
16.05	Draw isometric exterior views.
16.06	Draw perspective exterior views.
17.0	Research the history of the built environment. The students will be able to:
17.01	Describe the significance of major architects, engineers or inventors to understand their historical influences.
17.02	Research innovative historical architectural and/or engineering works and examine the significance of their legacy for the future.
17.03	Identify transitions in design media, technique and focus to explain how technology has changed design throughout history.
18.0	Investigate sustainability issues related to the design, construction and maintenance of the built environment. The student will be able to:
18.01	Describe the impact of the construction industry on the natural environment.
18.02	Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.
18.03	Research and recommend sustainable design solutions.

CTE Standards and Benchmarks	
	18.04 Identify specific design practices that can lessen adverse impacts on the environment.
	18.05 Explain the environmentally sustainable features of a building.
	18.06 Invite the US Green Building Council to make a presentation. (optional)
19.0	Examine career opportunities in drafting and related fields to determine requisite skills, qualifications, supply and demand, market location and potential earnings. The student will be able to:
	19.01 Identify and demonstrate positive work behaviors needed to be employable.
	19.02 Develop and use criteria to select works for a digital career portfolio.
	19.03 Evaluate and compare employment opportunities that match career goals.
	19.04 Examine licensing, certification, education and industry credentialing requirements for careers in design and construction industry.
	19.05 Identify opportunities and research requirements for career advancement.

Florida Department of Education
Student Performance Standards

Course Title: **Architectural Drafting 5**
Course Number: **8725450**
Course Credit: **1**

Course Description:

This course focuses on computer-aided residential architectural drafting and design.

CTE Standards and Benchmarks	
20.0	Design and draft computer-aided architectural multi-level residential drawings. The student will be able to:
20.01	Describe codes that govern the practice of architecture and professions in the construction industry.
20.02	Discuss liability issues and consequences of construction documents as “the contract”. The significance of what they draw to the real world.
20.03	Compare architectural designs to understand how technical and utilitarian components impact aesthetic qualities.
20.04	Apply rules of convention to create purposeful residential design.
20.05	Analyze the capacity of the visual arts to fulfill aesthetic needs through architectural and utilitarian objects.
20.06	Design and draft a first floor plan.
20.07	Design and draft a second floor plan.
20.08	Design and draft a basic roof framing layout drawing.
20.09	Design and draft a two-story elevation drawing.
20.10	Prepare a second floor framing plan.
21.0	Prepare a detailed computer-aided site plan drawing. The student will be able to:
21.01	Layout a residential site plan.
21.02	Indicate site plan size and limits.
21.03	Indicate site plan orientation.
21.04	Layout a public street and sidewalk.

CTE Standards and Benchmarks	
	21.05 Layout public utility lines.
	21.06 Write a site plan legal description.
	21.07 Dimension a building location.
	21.08 Layout and label specialty features (e.g., patio, pool, gazebo, etc.).
	21.09 Locate easements and setbacks.
22.0	Design and draft a basic computer-aided landscape plan drawing. The student will be able to:
	22.01 Research and specify water-efficient landscaping.
	22.02 Layout landscape features.
	22.03 Develop a schedule of plants/shrubs.
	22.04 Develop a list of landscape symbols.

Florida Department of Education
Student Performance Standards

Course Title: **Architectural Drafting 6**
Course Number: **8725460**
Course Credit: **1**

Course Description:

This course focuses on computer-aided residential architectural drawings, commercial construction documents and presentation drawings.

CTE Standards and Benchmarks	
23.0	Prepare a computer-aided wall section. The student will be able to:
23.01	Prepare a two-story residential wall section.
23.02	Apply notes and dimensions to residential wall section.
24.0	Prepare a detailed computer-aided foundation plan drawing. The student will be able to:
24.01	Prepare a foundation plan drawing for a residence.
24.02	Prepare foundation detail drawings.
25.0	Prepare a detailed computer-aided electrical plan drawing--The student will be able to:
25.01	Lay out an electrical plan for a residence.
25.02	Apply electrical symbols legend to electrical plan.
26.0	Prepare a detailed computer-aided Heating, Ventilation and Air-Conditioning (HVAC) plan drawing. The student will be able to:
26.01	Lay out an HVAC plan for a residence.
26.02	Prepare an HVAC symbols legend for an HVAC plan.
27.0	Prepare a detailed computer-aided plumbing plan drawing. The student will be able to:
27.01	Lay out a plumbing plan for a residence.
27.02	Draw a plumbing riser diagram for a residence.
27.03	Prepare a plumbing symbols legend for a plumbing plan.

CTE Standards and Benchmarks	
28.0	Design and draft computer-aided architectural drawings for a commercial building. The student will be able to:
28.01	Apply rules of convention to create purposeful commercial design.
28.02	Interpret catalogs, specifications, technical tables, codes and ordinances for commercial buildings.
28.03	Prepare a commercial site plan.
28.04	Design and draft a floor plan, with dimensions, for a commercial building.
28.05	Prepare a foundation plan with dimensions and a footing schedule.
28.06	Prepare a roof plan.
28.07	Design and draft elevation drawings.
28.08	Prepare a building section.
28.09	Prepare door and window schedules.
29.0	Draft detailed computer-aided Mechanical, Electrical and Plumbing (MEP) drawings. The student will be able to:
29.01	Lay out an electrical plan for a commercial building.
29.02	Lay out an HVAC plan for a commercial building.
29.03	Lay out a plumbing plan for a commercial building.
30.0	Prepare presentation drawings. The student will be able to:
30.01	Create a body of collaborative work to show artistic cohesiveness, team building, respectful compromise and time-management skills.
30.02	Concentrate on a particular style, theme or concept to compile content for a portfolio, display or exhibition.
30.03	Process and apply constructive criticism as formative assessment for continued creative growth.
30.04	Produce color pictorial drawings for a commercial building.
30.05	Prepare a dynamic presentation zoom views or walk-thru.
30.06	Develop a presentation of digital portfolio to interview and/or apply for a drafting-related position or educational program.

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.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. 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 IEP served in Exceptional Student Education (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 and regulated secondary programs 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 course or a modified course. 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 a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. 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.

Florida Department of Education
Curriculum Framework

Program Title: **Civil and Surveying Drafting ***
Program Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

*** NOTE:** This program was formerly called ***Structural Drafting***, but renamed by the 2019 Review Committee (and approved by districts that teach this program) to correctly reflect the standards and benchmarks being taught. ***Structural Drafting 5 & 6*** course names have also been changed to **Civil and Surveying Drafting 5 & 6.**

Secondary – Career Preparatory	
Program Number	8101200
CIP Number	0615130112
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CTSO	SkillsUSA
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The purpose of this program is to prepare students for employment or advanced training in the civil and surveying drafting industry and related fields.

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 freehand sketching, drafting by hand and computer and 3D modeling specific to civil and surveying drafting.

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 totaling six credits. The four courses, Drafting 1, 2, 3, 4, are considered core courses for the other secondary Drafting programs.

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

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2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Apply basic drafting, sketching and Computer-Aided Drawing (CAD) techniques and skills.
02.0 Apply the design procedures.
03.0 Design and prepare multi-view drawings using 2D sketching and/or CAD software.
04.0 Prepare sectional views using 2D sketching and/or CAD software.
05.0 Prepare auxiliary drawings using 2D sketching and/or CAD software.
06.0 Apply basic dimensioning and annotation using 2D sketching and/or CAD software.
07.0 Prepare working drawings.
08.0 Prepare pictorial drawings using 2D sketching and/or CAD software.
09.0 Prepare surface developments (optional).
10.0 Perform basic computer-aided drafting functions using CAD software.
11.0 Apply three-dimensional modeling concepts using CAD software.
12.0 Design and prepare basic architectural drawings using 2D sketching and/or CAD software.
13.0 Demonstrate an understanding of basic civil drawings.
14.0 Perform computer-aided drafting functions using 3D modeling software to create an architectural model or other type of model.
15.0 Describe the importance of professional ethics and legal responsibilities in the design and construction industry.
16.0 Prepare computer-aided three-dimensional architectural drawings.
17.0 Research the history of the built environment.
18.0 Investigate sustainability issues related to the design, construction and maintenance of the built environment.
19.0 Examine career opportunities in drafting and related fields to determine requisite skills, qualifications, supply and demand, market location and potential earnings.
20.0 Investigate the surveying and mapping profession.
21.0 Conduct survey measurements.
22.0 Design and draft mapping drawings using CAD software.
23.0 Design and draft mapping details using CAD software.
24.0 Prepare surveying and mapping drawings using CAD software.
25.0 Investigate the civil engineering profession.
26.0 Design and draft basic civil drawings using CAD software.
27.0 Prepare presentation drawings using perspective techniques or CAD software.

Florida Department of Education
Student Performance Standards

Course Title: **Drafting 1**
Course Number: **8725010**
Course Credit: **1**

Course Description:

This course provides instruction in basic drawing and drafting skills, applied mathematics, multi-view and sectional drawings.

CTE Standards and Benchmarks	
01.0	Apply basic drafting, sketching and Computer-Aided Drawing (CAD) techniques and skills. The student will be able to:
01.01	Use and maintain drafting equipment, measuring scales, drafting instruments and reproduction equipment.
01.02	Identify and use the various drafting media and techniques.
01.03	Demonstrate the use of the alphabet of lines.
01.04	Prepare title blocks and other drafting formats.
01.05	Use various freehand and other lettering techniques.
01.06	Develop skill in sketching and mark making to plan, execute and construct two-dimensional images or three-dimensional models, including presentation graphics.
01.07	Apply geometric construction techniques.
01.08	Solve geometric, algebraic and trigonometric problems related to drafting.
01.09	Demonstrate care of equipment.
01.10	Apply use of effective and accurate architectural and/or engineering vocabulary throughout design and drafting process.
02.0	Apply the design procedures. The student will be able to:
02.01	Analyze challenges and identify solutions for design problems.
02.02	Investigate the use of space, scale and environmental features to create three-dimensional form, or the illusion of depth and form.
02.03	Analyze and apply data and measurements to solve problems and interpret drawings.
03.0	Design and prepare multi-view drawings using 2D sketching and/or CAD software. The student will be able to:

CTE Standards and Benchmarks	
	03.01 Prepare multi-view scaled drawings.
	03.02 Select proper drawing scale, views and layout.
	03.03 Prepare drawings containing horizontal and vertical surfaces.
	03.04 Prepare drawings containing circles and/or arcs.
	03.05 Prepare removed details and conventional breaks.
04.0	Prepare sectional views using 2D sketching and/or CAD software. The student will be able to:
	04.01 Prepare drawings containing full sections and half sections.
	04.02 Prepare drawings containing offset sections.
	04.03 Prepare drawings containing revolved sections.
	04.04 Prepare drawings containing removed sections and broken-out sections.
	04.05 Prepare a sectional assembly drawing applying material symbols.
05.0	Prepare auxiliary drawings using 2D sketching and/or CAD software. The student will be able to:
	05.01 Prepare drawings containing primary auxiliary views.
	05.02 Prepare drawings containing auxiliary views that include curved lines.
06.0	Apply basic dimensioning and annotation using 2D sketching and/or CAD software. The student will be able to:
	06.01 Prepare drawings containing linear, angular and circular standard dimensions.
	06.02 Prepare drawings using general and local notes.
	06.03 Apply basic tolerance techniques and nominal and actual dimensions.
07.0	Prepare working drawings. The student will be able to:
	07.01 Prepare assembly drawings.
	07.02 Prepare detail drawings.
	07.03 Prepare technical drawings.

CTE Standards and Benchmarks	
	07.04 Modify drawings to include material specifications and parts list.
08.0	Prepare pictorial drawings using 2D sketching and/or CAD software. The student will be able to:
	08.01 Prepare isometric, oblique and other pictorial drawings.
	08.02 Prepare one-point and two-point perspectives.
	08.03 Prepare presentation graphics.
09.0	Prepare surface developments. (optional) The student will be able to:
	09.01 Prepare developments of prisms, cylinders, cones and pyramids.
	09.02 Prepare developments of a transition piece.
	09.03 Prepare drawings involving intersecting pieces.
10.0	Perform basic computer-aided drafting functions using CAD software. The student will be able to:
	10.01 Demonstrate organizational skills to influence the sequential process when creating drawings.
	10.02 Construct geometric figures of lines, splines, circles, arcs, etc., to represent plans and/or mechanical assemblies.
	10.03 Create and edit text using appropriate style and size to annotate drawings.
	10.04 Create and use multi-leaders.
	10.05 Use control accuracy enhancement tools for entity positioning methods such as snap and XYZ.
	10.06 Use editing commands.
	10.07 Use viewing commands to perform zooming and panning.
	10.08 Plot drawings on media using layout and scale.
	10.09 Use query commands to interrogate database for entity characteristics, distance, area and status.
	10.10 Apply standard dimensioning rules.
	10.11 Move, stretch and offset objects.
	10.12 Create a radius between objects.

CTE Standards and Benchmarks	
	10.13 Trim and extend objects.
	10.14 Break and join objects.
	10.15 Create and edit dimensions and work with dimension styles.
	10.16 Change object properties.
	10.17 Crosshatch objects.
	10.18 Apply external references.
	10.19 Isolate and hide objects.
	10.20 Use selection set methods.
	10.21 Use rectangular and polar arrays.
	10.22 Use rotation reference angles.
	10.23 Use elements of creativity and organizational principles to create visually coherent views and layouts.
	10.24 Create and manage layers or levels.
	10.25 Use page setup for plotting.
	10.26 Create, insert and edit reusable content such as symbols and blocks or cells.
	10.27 Use specific line types.
	10.28 Create fills and gradients.
	10.29 Edit hatch patterns and fills.
11.0	Apply three-dimensional modeling concepts using CAD software. The student will be able to:
	11.01 Use coordinate systems to locate objects in three-dimensional space.
	11.02 Use basic geometric shapes available in two-dimensional and three-dimensional modeling software.
	11.03 Define the parameters used for determining size, placement and orientation of a modeling object.
	11.04 Describe the Boolean modeling operations of union, subtraction and intersection.

CTE Standards and Benchmarks	
11.05	Demonstrate extrusion or sweeping techniques that transform two-dimensional objects into three-dimensional objects.
11.06	Describe the ‘revolve’ or ‘lathe’ techniques for animating a two-dimensional object and give examples of their application.
11.07	Use scale, rotate and move actions that comprise the transformation technique for animating a three-dimensional object.
11.08	Use basic viewing navigation tools such as zoom, rotate and panning.
11.09	Work with materials, techniques and processes through practice and perseverance to create desired result in two-dimensional and three-dimensional models.
11.10	Analyze challenges and identify solutions for three-dimensional design problems.
11.11	Investigate the use of space, scale and environmental features within a model to create three-dimensional form or the illusion of depth and form.
11.12	Apply materials, ideas, images and/or equipment from other content areas to generate ideas and processes for the development of three-dimensional models.
11.13	Investigate the use of various technology, software and media design to reflect creative trends in visual culture.

Florida Department of Education
Student Performance Standards

Course Title: **Drafting 2**
Course Number: **8725020**
Course Credit: **1**

Course Description:

This course provides competencies in basic architectural and civil computer-aided drafting and design, as well as an overview of the history of the built environment.

CTE Standards and Benchmarks	
12.0	Design and prepare basic architectural drawings using 2D sketching and/or CAD software. The student will be able to:
12.01	Solve design problems, through convergent and divergent thinking, to gain new perspectives.
12.02	Apply critical thinking and problem solving skills to develop creative solutions for design problems.
12.03	Draw a site plan.
12.04	Draw a floor plan.
12.05	Draw interior and exterior elevations.
12.06	Draw a roof plan.
12.07	Prepare door/window schedules.
12.08	Draw wall sections.
12.09	Draw a plumbing plan. (optional)
12.10	Draw an electrical plan.
12.11	Draw a Heating, Ventilation and Air Conditioning (HVAC) plan. (optional)
12.12	Draw a roof framing plan. (optional)
12.13	Review and revise plans throughout the design process to refine and achieve design objective.
12.14	Demonstrate flexibility and adaptability throughout the design process.

CTE Standards and Benchmarks	
	12.15 Define a basic project materials list.
	12.16 Calculate a basic project quantity take-off.
13.0	Demonstrate an understanding of basic civil drawings. The student will be able to:
	13.01 Apply use of effective and accurate civil terminology throughout the design process.
	13.02 Read and interpret civil drawings.
	13.03 Read and interpret plan and profile drawings.
	13.04 Read and interpret topographic drawings.

Florida Department of Education
Student Performance Standards

Course Title: **Drafting 3**
Course Number: **8725030**
Course Credit: **1**

Course Description:

This course provides instruction in computer-aided drafting skills, professional ethics and career and education planning.

CTE Standards and Benchmarks	
14.0	Perform computer-aided drafting functions using 3D modeling software to create an architectural model or other type of model. The student will be able to:
14.01	Draw lines, arcs, circles, etc. to represent plans and/or mechanical assemblies.
14.02	Create text styles, text justification and multi-line text.
14.03	Create and use multi-leaders.
14.04	Edit dimensions.
14.05	Work with dimension styles.
14.06	Crosshatch objects.
14.07	Apply external references.
14.08	Isolate and hide objects.
14.09	Use selection set methods.
14.10	Use rectangular and polar arrays.
14.11	Use rotation reference angles.
14.12	Use elements of creativity and organizational principles to create visually coherent views and layouts.
14.13	Create and manage layers or levels.
14.14	Use page setup for plotting.
14.15	Create, insert and edit reusable content such as symbols and blocks or cells.

CTE Standards and Benchmarks	
	14.16 Use specific line types.
	14.17 Create fills and gradients.
	14.18 Edit hatch patterns and fills.
15.0	Describe the importance of professional ethics and legal responsibilities in the design and construction industry. The student will be able to:
	15.01 Evaluate and justify decisions based on ethical reasoning.
	15.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities and employer policies.
	15.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
	15.04 Interpret and explain written organizational policies and procedures.
	15.05 Demonstrate personal responsibility, ethics and integrity, including respect for intellectual property, when accessing information and creating design projects.

Florida Department of Education
Student Performance Standards

Course Title: **Drafting 4**
Course Number: **8725040**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in three-dimensional modeling and sustainability issues related to the design, construction and maintenance of the built environment.

CTE Standards and Benchmarks	
16.0	Prepare computer-aided three-dimensional architectural drawings. The student will be able to:
16.01	Use technology to facilitate creative process and techniques.
16.02	Investigate the use of various technologies and resources to inspire creative design
16.03	Compare and analyze traditional and digital media to learn how technology has altered opportunities for innovative responses and results.
16.04	Draw plans and elevations.
16.05	Draw isometric exterior views.
16.06	Draw perspective exterior views.
17.0	Research the history of the built environment. The students will be able to:
17.01	Describe the significance of major architects, engineers or inventors to understand their historical influences.
17.02	Research innovative historical architectural and/or engineering works and examine the significance of their legacy for the future.
17.03	Identify transitions in design media, technique and focus to explain how technology has changed design throughout history.
18.0	Investigate sustainability issues related to the design, construction and maintenance of the built environment. The student will be able to:
18.01	Describe the impact of the construction industry on the natural environment.
18.02	Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.
18.03	Research and recommend sustainable design solutions.

CTE Standards and Benchmarks	
	18.04 Identify specific design practices that can lessen adverse impacts on the environment.
	18.05 Explain the environmentally sustainable features of a building.
	18.06 Invite the US Green Building Council to make a presentation. (optional)
19.0	Examine career opportunities in drafting and related fields to determine requisite skills, qualifications, supply and demand, market location and potential earnings. The student will be able to:
	19.01 Identify and demonstrate positive work behaviors needed to be employable.
	19.02 Develop and use criteria to select works for a digital career portfolio.
	19.03 Evaluate and compare employment opportunities that match career goals.
	19.04 Examine licensing, certification, education and industry credentialing requirements for careers in design and construction industry.
	19.05 Identify opportunities and research requirements for career advancement.

Florida Department of Education
Student Performance Standards

Course Title: **Civil and Surveying Drafting 5**
Course Number: **8725550**
Course Credit: **1**

Course Description:

This course focuses on investigating the surveying and mapping profession, conducting surveys, and designing and drafting maps and map details.

CTE Standards and Benchmarks	
20.0	Investigate the surveying and mapping profession. The student will be able to:
20.01	Describe the role of the surveyor/mapper.
20.02	Describe the historical significance of surveying/mapping.
20.03	Describe the surveyor's role and function today.
20.04	Investigate surveying and mapping practices in the United States.
20.05	Describe Florida's laws for surveying and mapping.
20.06	Describe sections/townships, ranges, metes and bounds and plats.
20.07	Describe legal descriptions.
20.08	Identify the types and purposes of surveys (i.e., boundary, topographic, as-built, etc.)
20.09	Investigate the use of various technologies and resources to inspire creative design.
20.10	Use technology to facilitate creative process and techniques.
20.11	Compare and analyze traditional and digital media to learn how technology has altered opportunities for innovative responses and results.
21.0	Conduct survey measurements. The student will be able to:
21.01	Identify the types of equipment used for horizontal measurement.
21.02	Identify the types of equipment for vertical measurement.
21.03	Use and calculate survey bearings.

CTE Standards and Benchmarks	
	21.04 Measure horizontal distances.
	21.05 Measure angles.
	21.06 Measure vertical distances (leveling procedure).
22.0	Design and draft mapping drawings using CAD software. The student will be able to:
	22.01 Prepare traverse drawings.
	22.02 Prepare plat drawings.
	22.03 Prepare street layout drawings.
	22.04 Prepare map drawings.
23.0	Design and draft mapping details using CAD software. The student will be able to:
	23.01 Draft a range, section and township map.
	23.02 Prepare a map using bearings.
	23.03 Prepare a map using coordinates.
	23.04 Convert a map into metric dimensions.
	23.05 Prepare a map using a Triangulated Irregular Network (TIN).
	23.06 Prepare a map using contour lines.
24.0	Prepare surveying and mapping drawings using CAD software. The student will be able to:
	24.01 Use appropriate line work in a drawing.
	24.02 Prepare drawings that include lot lines, easements, setbacks and building lines.
	24.03 Prepare a platted residential lot survey.
	24.04 Prepare multi-lot plat drawings with roadway networks.
	24.05 Prepare a topographic survey with ground elevations.
	24.06 Prepare a computer-aided drawing with Triangulated Irregular Network (TIN).

Florida Department of Education
Student Performance Standards

Course Title: **Civil and Surveying Drafting 6**
Course Number: **8725560**
Course Credit: **1**

Course Description:

This course focuses on the use of aerial photography, surveying and mapping procedures, civil drafting and design, and presentation drawings.

CTE Standards and Benchmarks	
25.0	Investigate the civil engineering profession. The student will be able to:
25.01	Understand the role of a civil engineer.
25.02	Understand the historical significance of engineering.
25.03	Understand the civil engineer's role and function today.
25.04	Identify different disciplines of civil engineering practices in the United States.
25.05	Understanding the integrated roles between civil engineers, surveyors and mappers, landscape architects, and land planners.
25.06	Understand the different laws and regulations civil engineer's abide to: state, county, city, and district regulations.
25.07	Identify the types and purposes of construction plans civil engineers design (i.e., drainage plans, utility plans, roadway plans, structural plans, detail sheets, etc.).
25.08	Investigate the use of various technologies and resources to inspire creative design.
25.09	Use technology to facilitate creative process and techniques.
25.10	Compare and analyze traditional and digital media to learn how technology has altered opportunities for innovative responses and results.
26.0	Design and draft basic civil drawings using CAD software. The student will be able to:
26.01	Prepare paving, grading, and drainage plans that include proposed elevations, storm drainage structures and corresponding drainage pipes using a boundary and topographic survey provided by a surveyor/mapper.
26.02	Prepare utility plans using survey and as-built drawings provided by a surveyor/mapper (i.e., water main locations, gravity lines, force mains, lift station location, fire hydrants, etc.).
26.03	Understand utility conflicts and required separations between utility pipes and drainage pipes.

CTE Standards and Benchmarks	
	26.04 Prepare plan and profile sheets for utility plans incorporating separation and cover requirements.
	26.05 Prepare a detail sheet.
	26.06 Understand the setup of roadway construction plans and the use of baseline surveys, profile grade lines and plan and profile drawings.
	26.07 Prepare a simple roadway construction plan set.
	26.08 Prepare record drawings of storm water, water distribution and sanitary sewer systems.
	26.09 Prepare computer-aided drawings and calculations for quantity take-offs.
27.0	Prepare presentation drawings using perspective techniques or CAD software. The student will be able to:
	27.01 Create a body of collaborative work to show artistic cohesiveness, team building, respectful compromise and time-management skills.
	27.02 Concentrate on a particular style, theme or concept to compile content for a portfolio, display or exhibition.
	27.03 Process and apply constructive criticism as formative assessment for continued creative growth.
	27.04 Develop a presentation of digital portfolio to interview and/or apply for a drafting-related position or educational program.

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.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. 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 IEP served in Exceptional Student Education (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 and regulated secondary programs 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 course or a modified course. 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 a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. 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.

Florida Department of Education
Curriculum Framework

Program Title: **Carpentry**
Program Type: **Career Preparatory**
Career Cluster: **Architecture & Construction**

Secondary – Career Preparatory	
Program Number	8104300
CIP Number	0646020116
Grade Level	9-12
Program Length	5 Credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-3012 – Helpers-Carpenters 47-2031 – Carpenters
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this secondary program is to prepare students for employment in the carpentry industry with an emphasis on learning fundamental carpentry skills.

This program prepares students to enter the construction industry as an apprentice (carpenters helper) to assist journeyman carpenters to construct, erect, install, and repair structures and fixtures made from wood and other materials. Help maintain work areas and equipment, and mange building materials and supplies on the construction site. Expectation is that the journeyman carpenter will teach the carpenter helper to become a journeyman carpenter.

The content includes but is not limited to developing rough and finish carpentry skills.

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

Program Structure

This program is a planned sequence of instruction totaling five credits.

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

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8104310	Carpentry Fundamentals	CAB WOODWK @7 7G CARPENTRY @7 7G BLDG CONST @7 7G TEC CONSTR @7 7G	1 Credit	47-3012	2	CT
8104320	Carpentry Layout		1 Credit		2	CT
8104330	Carpentry Framing		1 Credit	47-2031	3	CT
8104340	Carpentry Exterior		1 Credit		3	CT
8104350	Carpentry Finish		1 Credit		3	CT

(Graduation Requirement Codes: CT= Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA= Mathematics, PL= Personal Financial Literacy)

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Apply shop and construction site safety skills.
02.0 Select, use and maintain hand tools, power tools and stationary equipment.
03.0 Apply mathematics knowledge to assist in constructing buildings, structures, and various construction and woodworking related projects.
04.0 Read, understand and create basic construction and shop drawings and/or sketches.
05.0 Select and recommend appropriate building materials for building and woodworking projects.
06.0 Select and use appropriate fasteners and hardware for specific construction and woodworking applications.
07.0 Set up and install basic rigging and scaffolding.
08.0 Identify ways that sustainable design and construction strategies impact the built environment. (Optional)
09.0 Explain the importance of employability and entrepreneurship skills. (Optional)
10.0 Perform site-preparation and building layout activities.
11.0 Understand how to layout and/or construct a building foundation.
12.0 Layout, cut and install framing members for a floor system (wood and/or metal).
13.0 Layout, cut and install a wall framing system (wood and/or metal).
14.0 Comply with current hurricane building codes.
15.0 Layout, cut and install a wood frame roof system.
16.0 Frame walls using cold-formed steel. (Optional)
17.0 Lay out, cut and rough frame a stair system.
18.0 Identify, select and install various roofing materials for building structures.
19.0 Identify and apply appropriate thermal boundary, moisture protection and water management systems.
20.0 Install windows and exterior doors.
21.0 Install gypsum drywall.
22.0 Identify and fasten wood stock and joints.
23.0 Install cabinets and components. (Optional)

Florida Department of Education
Student Performance Standards

Course Title: **Carpentry Fundamentals**
Course Number: **8104310**
Course Credit: **1**

Course Description:

The purpose of this course is for the student to develop competencies essential to the carpentry industry including safety, use of manual and power tools, applied math, construction plan drawing, building materials, fasteners and hardware, rigging and scaffolding, sustainability and employability skills.

CTE Standards and Benchmarks	
01.0	Apply shop and construction site safety skills. The student will be able to:
01.01	Maintain a clean, orderly and safe work area.
01.02	Transport, handle and store materials safely.
01.03	Operate a fire extinguisher.
01.04	Qualify in basic first-aid procedures and (*optional)* obtain CPR/FA/AED 2 year certification.
01.05	Know how to identify and report safety hazards and (*optional)* be able to fill out and report a sample Accident Report to the supervisor.
01.06	Demonstrate the inspection, proper use, inspection and care of personal protective equipment (PPE).
01.07	Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200).
01.08	Explain the purpose of the Occupational Safety and Health Administration (OSHA) and (*optional)* obtain an OSHA-10 Safety Certification.
01.09	Use Safety Data Sheets (SDS) to recognize health-related problems that may result from exposure to hazardous materials and chemicals.
01.10	Describe the proper procedures for handling hazardous materials.
01.11	Explain the importance of complying with the Americans with Disabilities Act (ADA) requirements.
02.0	Select, use and maintain hand tools, power tools and stationary equipment. The student will be able to:
02.01	Read and demonstrate proficiency with carpenter's measuring tools.

CTE Standards and Benchmarks	
	02.02 Identify, select and safely use various hand tools.
	02.03 Identify, select and safely use hand held power tools and stationary equipment.
	02.04 Properly maintain hand tools, power tools and stationary equipment and learn about the maintenance of them.
03.0	Apply mathematics knowledge to assist in constructing buildings, structures, and various construction and woodworking related projects. The student will be able to:
	03.01 Apply geometry and algebra to solve construction related math problems.
	03.02 Use arithmetic to assist in constructing buildings, structures and woodworking projects.
	03.03 Use mathematics to solve distance, elevation, perimeter, area and volume problems.
04.0	Read, understand and create basic construction and shop drawings and/or sketches. The student will be able to:
	04.01 Identify basic construction and shop drawings, drawing terms, components and symbols.
	04.02 Interpret and apply information found on construction drawings and in specifications to assist in construction and woodworking projects.
	04.03 Recognize the different types of construction drawings.
	04.04 Use an architectural scale to determine and verify construction drawing dimensions.
	04.05 Identify, describe and state the purpose of the parts of written specifications.
	04.06 Conduct quantity takeoffs for estimating materials.
	04.07 Interpret and understand scopes of work for construction guidelines.
	04.08 Draw and/or sketch basic floor plans and/or shop drawings and elevations.
05.0	Select and recommend appropriate building materials for building and woodworking projects. The student will be able to:
	05.01 Identify the grades and species of lumber and their appropriate uses.
	05.02 Identify the actual and nominal sizes of lumber.
	05.03 Identify the grades of plywood and wood products and their uses.
	05.04 Identify defects and blemishes that affect the durability, strength and use of lumber.
	05.05 Determine how to locate and mark crowned, bowed or cupped framing lumber and how to cull it for use.

CTE Standards and Benchmarks	
	05.06 Explain the effects of temperature differences, chemical reaction and moisture content on building materials.
	05.07 Explain and identity the uses of various types of engineered lumber.
06.0	Select and use appropriate fasteners and hardware for specific construction and woodworking applications. The student will be able to:
	06.01 Identify and use fasteners and their appropriate applications commonly used in carpentry and/or cabinetmaking.
	06.02 Identify and use hardware and their appropriate applications commonly used in carpentry and/or cabinetmaking.
07.0	Set up and install basic rigging and scaffolding. The student will be able to:
	07.01 Identify and use rigging equipment.
	07.02 Inspect rigging equipment, following safety precautions.
	07.03 Estimate size, weight and center of the load.
	07.04 Use rigging methods to safely move materials and equipment.
	07.05 Correctly and safely assemble, inspect and disassemble scaffolding.
	07.06 Inspect and safely use various types of ladders and scaffolding.
08.0	Identify ways that sustainable design and construction strategies impact the built environment. (Optional) The student will be able to:
	08.01 Describe how sustainability practices impact the construction industry on the natural environment.
	08.02 Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.
	08.03 Recommend sustainable alternative carpentry practices as opposed to conventional carpentry practices.
	08.04 Identify specific practices that can lessen adverse impacts on the environment.
09.0	Explain the importance of employability and entrepreneurship skills. (Optional) The student will be able to:
	09.01 Identify and demonstrate positive work behaviors needed to be employable.
	09.02 Develop personal career plan that includes goals, objectives and strategies.
	09.03 Examine licensing, certification and industry credentialing requirements.
	09.04 Maintain an updated resume and a portfolio to document work knowledge, skills and experience.

CTE Standards and Benchmarks
09.05 Evaluate and compare employment opportunities that match career path goals.
09.06 Identify and exhibit traits for retaining employment.
09.07 Identify opportunities and research requirements for career advancement.
09.08 Research the benefits of ongoing professional development and education.
09.09 Examine and describe entrepreneurship opportunities as a career planning option.

Florida Department of Education
Student Performance Standards

Course Title: **Carpentry Layout**
Course Number: **8104320**
Course Credit: **1**

Course Description:

The purpose of this course is for the student to continue developing competencies essential to the carpentry profession. These competencies include site preparation and layout, building foundations, engineered structural lumber and floor system framing.

CTE Standards and Benchmarks	
10.0	Perform site-preparation and building layout activities. The student will be able to:
10.01	Identify building layout dimensions and elevations from plans and specifications using math skills.
10.02	Use a transit, a builder's level and laser level.
10.03	Erect batter boards and locate building lines.
10.04	Locate building line points on batter boards using a builder's level and measuring instruments.
10.05	Locate building lines on a site plan.
10.06	Square a building, using the 3-4-5-triangle method and the diagonal (Pythagorean Theorem) method.
11.0	Understand how to layout and/or construct a building foundation. The student will be able to:
11.01	Establish building and final grade elevations.
11.02	Identify various types of footings and foundations.
11.03	Identify various footing requirements used to support different types of foundations.
11.04	Identify and select appropriate footing and foundation construction details for a specified building plan.
11.05	Install flashing, foundation anchors and connectors, and termite shields.
11.06	Understand and/or apply proper moisture management details for foundations, if required.
11.07	Layout and construct a building foundation. (Optional)

CTE Standards and Benchmarks	
12.0	Layout, cut and install framing members for a floor system (wood and/or metal). The student will be able to:
12.01	Identify floor framing members including the subfloor.
12.02	Identify structural support components for floor framing systems (e.g., sill plates, columns, girder beams, etc.).
12.03	Identify various floor joist types, sizes and openings, including joists for a cantilevered floor.
12.04	Identify various types of bridging.
12.05	Identify various subfloor materials and fastening techniques.
12.06	Layout, cut and install framing members for a floor system.

Florida Department of Education
Student Performance Standards

Course Title: **Carpentry Framing**
Course Number: **8104330**
Course Credit: **1**

Course Description:

This Course focuses on framing walls and roofs, and provides an understanding of hurricane codes.

CTE Standards and Benchmarks	
13.0	Layout, cut and install a wall framing system (wood and/or metal). The student will be able to:
13.01	Identify framing members used in wall and partition construction.
13.02	Lay out wall lines and partition locations on a floor.
13.03	Lay out walls for studs, doors and windows.
13.04	Identify studs, trimmers, cripples, headers, fire stops and other framing components.
13.05	Layout, cut and build up wall partition intersecting T's, corners and headers.
13.06	Identify various wall sheathing and/or diagonal bracing systems used in exterior walls.
13.07	Identify and describe various insulation materials, moisture and air barrier materials and systems.
13.08	Cut and install framing members for a wall system.
14.0	Comply with current hurricane building codes. The student will be able to:
14.01	Install hurricane anchors and connectors using approved fasteners.
14.02	Install hurricane clips using approved fasteners.
14.03	Explain the purpose and importance of the codes relating to hurricanes.
14.04	Identify and/or construct braced and structural panel shear wall assemblies.
15.0	Layout, cut and install a wood frame roof system. The student will be able to:
15.01	Understand the terms associated with roof framing.

CTE Standards and Benchmarks
15.02 Identify roof framing members used to construct various roofing types.
15.03 Calculate the lengths of rafters for various locations.
15.04 Identify the various types of trusses used in roof framing.
15.05 Use a rafter framing square, speed square and calculator to lay out a roof system.
15.06 Identify various types of sheathing used in roof construction.
15.07 Layout, cut and frame various roof types using conventional framing methods.
15.08 Understand various truss types and components, and how to correctly install them.
15.09 Estimate materials needed to frame and sheath a roof.

Florida Department of Education
Student Performance Standards

Course Title: **Carpentry Exterior**
Course Number: **8104340**
Course Credit: **1**

Course Description:

This course provides students with knowledge and skills pertaining to cold-formed steel framing, exterior stair construction, roofing applications, thermal and moisture protection and window and door installation.

CTE Standards and Benchmarks	
16.0	Frame walls using cold-formed steel. (Optional) The student will be able to:
16.01	Identify the components of a steel framing wall system.
16.02	Identify and select the tools and fasteners used in a steel framing wall system.
16.03	Identify applications for steel framing wall systems.
16.04	Demonstrate the ability to build other cold-formed steel wall framing components.
16.05	Lay out and install a steel stud structural and/or non-structural wall with openings to include bracing and blocking.
17.0	Lay out, cut and rough frame a stair system. The student will be able to:
17.01	Identify various types of stair systems.
17.02	Identify the components of stair systems.
17.03	Calculate the size and number of treads and risers for a stair system.
17.04	Lay out, cut and assemble a stair system.
18.0	Identify, select and install various roofing materials for building structures. The student will be able to:
18.01	Identify the materials and methods used in roofing.
18.02	Explain the safety requirements for roofing installation jobs.
18.03	Install fiberglass/asphalt shingles on various roof types.

CTE Standards and Benchmarks	
	18.04 Install roofing materials correctly in a roof valley.
	18.05 Explain how to make various roof projections watertight when using fiberglass/asphalt shingles.
	18.06 Properly cut and install hip and ridge caps using fiberglass/asphalt shingles.
	18.07 Lay out, cut and install a cricket or saddle.
	18.08 Identify and discuss techniques for installing various types of roofing systems.
19.0	Identify and apply appropriate thermal boundary, moisture protection and water management systems. The student will be able to:
	19.01 Identify, select and install various types of insulation material and moister/air barriers.
	19.02 Calculate the required amounts of insulation and moisture/air barriers for a structure.
	19.03 Identify, select, and install materials to provide an effective water management system for a structure.
	19.04 Identify, discuss and/or install moisture, air, and vapor barriers.
	19.05 Describe air infiltration and exfiltration control requirements.
20.0	Install windows and exterior doors. The student will be able to:
	20.01 Identify various types of fixed, sliding and swinging windows including sliding, patio and French doors.
	20.02 Identify various materials and techniques used to install a window.
	20.03 Identify the requirements for a proper window installation.
	20.04 Install a pre-hung window in accordance with manufacturer’s installation instructions.
	20.05 Identify the common types of exterior doors and explain how they are constructed.
	20.06 Identify various materials and techniques used to install a door.
	20.07 Identify the types of thresholds and door frames used with exterior doors.
	20.08 Install a pre-hung exterior door.
	20.09 Identify the various types of locksets used on exterior doors and explain how they are installed.
	20.10 Discuss and/or install various types of locksets.

Florida Department of Education
Student Performance Standards

Course Title: **Carpentry Finish**
Course Number: **8104350**
Course Credit: **1**

Course Description:

This course provides students with knowledge and skills pertaining to finish carpentry. Competencies covered include drywall installation, cabinetry and an overview of construction documents.

CTE Standards and Benchmarks	
21.0	Install gypsum drywall. The student will be able to:
21.01	Identify the different types of drywall and their uses.
21.02	Select the type and thickness of drywall required for specific installations.
21.03	Select fasteners for drywall installation.
21.04	Perform single-layer and multi-layer drywall installations using different types of fastening systems including nails, drywall screws and adhesives.
21.05	Install drywall on wood or steel studs.
21.06	Estimate material quantities for a drywall installation.
22.0	Identify and fasten wood stock and joints. The student will be able to:
22.01	Identify types of glues, fasteners and clamps and describe their applications.
22.02	Fasten stock with glue and various types of clamps.
22.03	Fasten stock and joints with appropriate fasteners such as nails, staples, screws and bolts.
22.04	Fill and finish nail and screw holes with fillers and plugs.
23.0	Install cabinets and components. (Optional) The student will be able to:
23.01	Install hardware such as hinges, catches, pulls, knobs and guides on assembled cabinets.
23.02	Install fasteners.

CTE Standards and Benchmarks
23.03 Install drawers.
23.04 Install pre-fabricated cabinets, countertops and other components.
23.05 Install various types of doors including overlay, lipped and flush. (Optional, if taught)
23.06 Install adjustable shelving. (Optional, if taught)
23.07 Install glass panels and/or decorative metal grilles in cabinet doors. (Optional, if taught)
23.08 Install specialty hardware such as wire racks and “pull-outs”. (Optional, if taught)
23.09 Install sliding doors and track. (Optional, if taught)

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.

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Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. 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 IEP served in Exceptional Student Education (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 and regulated secondary programs 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 course or a modified course. 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 a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. 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.

Florida Department of Education
Curriculum Framework

Program Title: **Cabinetmaking**
Program Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

Secondary – Career Preparatory	
Program Number	8104400
CIP Number	0648070304
Grade Level	9-12
Program Length	5 Credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-3012 – Helpers-Carpenters 51-7011 – Cabinetmakers and Bench Carpenters
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 in the cabinetmaking industry.

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 developing carpentry and cabinetmaking skills.

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

Program Structure

This program is a planned sequence of instruction totaling five credits.

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

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8104410	Cabinetmaking 1	CAB WOODWK @7 7G CARPENTRY @7 7G BLDG CONSTR @7 7G TEC CONSTR @7 7G	1 Credit	47-3012	2	CT
8104420	Cabinetmaking 2		1 Credit		2	CT
8104430	Cabinetmaking 3		1 Credit	51-7011	3	CT
8720140	Cabinetmaking 4		1 Credit		2	CT
8720150	Cabinetmaking 5		1 Credit		2	CT

(Graduation Requirement Codes: CT= Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA= Mathematics, PL= Personal Financial Literacy)

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Apply shop safety skills.
02.0 Utilize manual and power tools relevant to the cabinetmaking profession.
03.0 Demonstrate mathematics knowledge and skills relevant to the cabinetmaking field.
04.0 Recommend appropriate building materials for specific scenarios.
05.0 Select appropriate fasteners and hardware for specific scenarios.
06.0 Apply occupational safety skills.
07.0 Select and use hand and power tools relevant to the cabinetmaking profession.
08.0 Read and design construction documents.
09.0 Prepare cabinets for finish.
10.0 Apply finishes.
11.0 Fasten stock and joints.
12.0 Install various countertop surfaces.
13.0 Install cabinets.
14.0 Apply laminates.
15.0 Install cabinets and components.
16.0 Explain the importance of employability and entrepreneurship skills.

Florida Department of Education
Student Performance Standards

Course Title: **Cabinetmaking 1**
Course Number: **8104410**
Course Credit: **1**

Course Description:

The purpose of this course is for the student to develop competencies essential to the carpentry and cabinetmaking industry. These competencies include safety, use of manual and power tools, applied math, plan reading, building materials, fasteners and hardware.

CTE Standards and Benchmarks	
01.0	Apply shop safety skills. The student will be able to:
01.01	Maintain a clean, orderly and safe work area.
01.02	Transport, handle and store materials safely.
01.03	Operate a fire extinguisher.
01.04	Qualify in basic first-aid procedures.
01.05	Identify safety hazards.
01.06	Demonstrate the use and care of personal protective equipment (PPE).
02.0	Utilize manual and power tools relevant to the cabinetmaking profession. The student will be able to:
02.01	Identify various hand and power tools.
02.02	Select correct tools for specific jobs.
02.03	Clean and care for tools and equipment.
02.04	Demonstrate proficiency in the safe use of hand and power tools.
02.05	Read and use carpenter's measuring tools.
03.0	Demonstrate mathematics knowledge and skills relevant to the cabinetmaking field. The student will be able to:
03.01	Apply geometry skills to solve math problems related to cabinetmaking with and without a calculator/phone calculator.

CTE Standards and Benchmarks	
	03.02 Demonstrate knowledge of arithmetic operations.
	03.03 Analyze and apply data and measurements to solve problems and interpret documents.
04.0	Recommend appropriate building materials for specific scenarios. The student will be able to:
	04.01 Identify the grades and species of lumber and their appropriate uses.
	04.02 Identify the actual and nominal sizes of lumber.
	04.03 Identify the grades of plywood and wood products.
	04.04 Identify defects and blemishes that affect the durability and strength of lumber.
	04.05 Explain the effects of temperature extremes, chemical reaction and moisture content on building materials.
	04.06 Explain the uses of various types of engineered lumber.
05.0	Select appropriate fasteners and hardware for specific scenarios. The student will be able to:
	05.01 Identify the fasteners commonly used in cabinetmaking.
	05.02 Identify the hardware commonly used in cabinetmaking.

Florida Department of Education
Student Performance Standards

Course Title: **Cabinetmaking 2**
Course Number: **8104420**
Course Credit: **1**

Course Description:

The purpose of this course is for the student to continue developing competencies essential to the cabinetmaking profession. These competencies include safety, hand and power tools, fastening methods, cabinet assembly and plan reading.

CTE Standards and Benchmarks	
06.0	Apply occupational safety skills. The student will be able to:
06.01	Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200)
06.02	Explain the purpose of the Occupational Safety and Health Administration (OSHA).
06.03	Identify health-related problems that may result from exposure to hazardous materials.
06.04	Describe the proper precautions for handling hazardous materials.
06.05	Explain eligibility and the procedures for obtaining worker's compensation.
06.06	Explain the importance of complying with the Americans with Disabilities Act (ADA) requirements.
07.0	Select and use hand and power tools relevant to the cabinetmaking profession. The student will be able to:
07.01	Identify the hand tools commonly used by carpenters and describe their uses.
07.02	Use hand tools in a safe and appropriate manner.
07.03	State the general safety rules for operating all power tools, regardless of type.
07.04	State the general rules for properly maintaining all power tools, regardless of type.
07.05	Identify the portable power tools commonly used by carpenters and describe their uses.
07.06	Use portable power tools in a safe and appropriate manner.
08.0	Read and design construction documents. The student will be able to:

CTE Standards and Benchmarks
08.01 Use an architect’s scale.
08.02 Explain the types of drawings usually included in a set of plans and list the information found on each type.
08.03 Identify the different types of lines used on construction drawings.
08.04 Identify selected abbreviations commonly used on plans.
08.05 Read and interpret plans, elevations, schedules, sections and details contained in basic construction drawings.
08.06 State the purpose of written specifications.
08.07 Conduct quantity takeoff for materials.
08.08 Design millwork and draw details in construction documents for a given scenario.

Florida Department of Education
Student Performance Standards

Course Title: **Cabinetmaking 3**
Course Number: **8104430**
Course Credit: **1**

Course Description:

This course provides students with a more in-depth knowledge of trim and finish carpentry/ cabinetmaking. Students will further their understanding of plan and specifications, assemble cabinet doors and install ceramic tile and countertop surfaces.

CTE Standards and Benchmarks	
09.0	Prepare cabinets for finish. The student will be able to:
09.01	Fill nail and screw holes.
09.02	Install wood plugs in prepared holes.
09.03	Sand a cabinet and joints for finish.
09.04	Select and apply proper filler.
09.05	Sand wood surfaces for finishing.
09.06	Stain, bleach, fill and seal wood surfaces as needed.
10.0	Apply finishes. The student will be able to:
10.01	Apply various types of finishes including lacquer-based, water-based, oil-based, enamel and polyurethane.
10.02	Apply the types of finishes that the local market demands.
10.03	Observe safety precautions when applying finishes, including wearing respirator and protective clothing approved by National Institute of Occupational Safety and Health (NIOSH).

Florida Department of Education
Student Performance Standards

Course Title: **Cabinetmaking 4**
Course Number: **8720140**
Course Credit: **1**

Course Description:

This course is designed to provide students with an in-depth knowledge of cabinet finishing. The content includes training in the assembly of cabinet components and how to fasten stock and joints.

CTE Standards and Benchmarks	
11.0	Fasten stock and joints. The student will be able to:
11.01	Identify types of glues and fasteners and describe their applications.
11.02	Fasten stock with glue and clamps.
11.03	Fasten stock and joints with appropriate fasteners such as nails, staples, screws and bolts.
11.04	Fill and finish nail and screw holes with fillers and plugs.
11.05	Glue and clamp stock using various techniques.

Florida Department of Education
Student Performance Standards

Course Title: **Cabinetmaking 5**
Course Number: **8720150**
Course Credit: **1**

Course Description:

This course is designed to provide students with the competencies needed and provides students with the in-depth training in the installation and lamination of cabinets.

CTE Standards and Benchmarks	
12.0	Install cabinets. The student will be able to:
12.01	Load and secure casework for hauling.
12.02	Check walls and floors for level and plumb.
12.03	Determine fasteners for block or walls.
12.04	Install upper and lower cabinets and other casework.
12.05	Fasten a suspended cabinet unit to ceiling.
12.06	Install countertops, including sink cutouts and back splash.
12.07	Cut and install molding and trim.
12.08	Adjust doors and drawers.
12.09	Clean work site.
13.0	Install various countertop surfaces. The student will be able to:
13.01	Install solid surface countertop.
13.02	Install wood countertop.
13.03	Install plastic laminate countertop.
13.04	Install stone (granite, quartz, marble, etc.), tile, stainless steel, or other type of countertop. (Optional)

CTE Standards and Benchmarks	
14.0	Apply laminates. The student will be able to:
14.01	Lay out and cut core stock to specifications.
14.02	Lay out and cut laminate to specification.
14.03	Apply adhesive.
14.04	Apply laminate to core stock.
14.05	Trim and file plastic laminate edges.
14.06	Clean laminated surfaces.
14.07	Laminate a curved surface.
14.08	Repair laminate defects.
15.0	Install cabinets components. The student will be able to:
15.01	Install hardware such as hinges, catches, pulls, knobs and guides on assembled cabinets.
15.02	Install fasteners.
15.03	Install drawers.
15.04	Install various types of doors including overlay, lipped and flush.
15.05	Install adjustable shelving.
15.06	Install glass panels and metal grills.
15.07	Install specialty hardware such as a lazy Susan, wire racks and “pull-outs”.
15.08	Install sliding doors and track.
16.0	Explain the importance of employability and entrepreneurship skills. The student will be able to:
16.01	Identify and demonstrate positive work behaviors needed to be employable.
16.02	Develop personal career plan that includes goals, objectives and strategies.
16.03	Examine licensing, certification and industry credentialing requirements.

CTE Standards and Benchmarks
16.04 Maintain a career portfolio to document knowledge, skills and experience.
16.05 Evaluate and compare employment opportunities that match career goals.
16.06 Identify and exhibit traits for retaining employment.
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Additional Information

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Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. 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 IEP served in Exceptional Student Education (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 and regulated secondary programs 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 course or a modified course. 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 a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. 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.

Florida Department of Education
Curriculum Framework

Program Title: **Building Construction Management**
Program Type: **Career Preparatory**
Career Cluster: **Architecture & Construction**

Secondary – Career Preparatory	
Program Number	8104600
CIP Number	0652200200
Grade Level	9– 12
Program Length	4 Credits
Teacher Certification	Refer to the **Program Structure** section.
SOC Code	11-9021 -- Construction Managers
CTSO	SkillsUSA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

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 Architecture & 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 & Construction career cluster.

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 four credits.

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

The following table illustrates the secondary course/program structure:

Course Number	Course Title	Teacher Certification	Length	Level	Graduation Requirement
8104610	Construction Management Foundations	BLDG Const 7G @7 BLDG Maint 7G @7 DRAFTING 7G @7 ENG 7G PLTW PTE 7G TECH Const 7G @7 TECH Draft 7G TEC ED 1@2 ENG&TEC ED 1@2	1 Credit	3	CT
8104620	Construction Design and Technique		1 Credit	3	CT
8104630	Construction Project Management		1 Credit	3	CT
8104640	Entrepreneurship in Architecture, Construction, and Engineering		1 Credit	3	CT

(Graduation Requirement Codes: CT= Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA= Mathematics, PL= Personal Financial Literacy)

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

Construction Management Foundations

01.0 Demonstrate safety practices and follow disaster plans.
02.0 Identify and safely use basic hand tools and power tools and describe their proper operation.
03.0 Understand construction components, materials, hardware, and characteristics.
04.0 Use vocabulary, symbols, and formulas commonly used in design and construction.
05.0 Demonstrate a basic understanding of computer– aided design (CAD) software.
06.0 Demonstrate rough carpentry skills and masonry processes.
07.0 Demonstrate electrical rough in skills.
08.0 Demonstrate heating, ventilation, and air– conditioning (HVAC) rough in skills.
09.0 Demonstrate finishing carpentry skills.
10.0 Explain all that the built environment encompasses.
11.0 Compare and contrast the building systems and components.
12.0 Explain the importance of employability and entrepreneurship skills.

Construction Design and Technique

13.0 Develop a basic understanding of construction contracts and how they apply to the construction process.
14.0 Develop analogical reasoning to identify and propose solutions in construction projects.
15.0 Understand the Request for Proposal (RFP) process.
16.0 Read, interpret, and use technical drawings, documents, and specifications to plan a project.
17.0 Demonstrate an understanding of the process of selecting interior and exterior design elements.
18.0 Explain the importance of employability and entrepreneurship skills.
19.0 Participate in the conceptual development of a construction project and oversee its organization, scheduling, budgeting, and implementation.

Construction Project Management

20.0 Apply building code, laws, and rules in the design and construction of projects.
21.0 Identify the diversity of needs, values, and social patterns in project design, including accessibility standards, to appropriately meet client needs.
22.0 Demonstrate mathematics knowledge and skills through the process of project planning and cost estimating to create a budget.
23.0 Understand contractual relations with all parties involved in the building process to ensure successful build of a project.
24.0 Understand approval procedures to ensure effective flow of information in the construction process.
25.0 Use architecture and construction skills to create and manage a project through the use of a developed RFP.
26.0 Manage relationships with internal and external parties to successfully complete construction.
27.0 Understand and implement testing and inspection procedures to ensure successful completion.
28.0 Explain the importance of employability and entrepreneurship skills.

Entrepreneurship in Architecture, Construction, and Engineering

29.0 Discuss the role of the entrepreneur in the architecture, construction, and engineering fields.
30.0 Discuss entrepreneurship in the fields of architecture, construction, and engineering as a career choice.
31.0 Identify the basic economic principles of entrepreneurship in the fields of architecture, construction, and engineering.
32.0 Outline and present the steps in planning a new architecture, construction, and engineering business.
33.0 Understand the purpose and application of SWOT Analysis.
34.0 Identify the principles of marketing an architecture, construction, or engineering business.
35.0 Identify the principles of selling as it relates to the architecture, construction, and engineering fields.
36.0 Identify the principles of financing.
37.0 Identify the types and sources of government regulations and taxation that may affect an architecture, construction, or engineering business.
38.0 Explain the importance of employability and entrepreneurship skills in the architecture, construction, and engineering fields.
39.0 Understand the roles and responsibilities among trades and professions including labor/management relationships.
40.0 Research laws applicable to the construction industry.

Florida Department of Education
Student Performance Standards

Course Title: **Construction Management Foundations**
Course Number: **8104610**
Course Credit: **1**

Course Description:

The purpose of this course is to provide students with competencies in safety practices; the use of hand and power tools; construction components, materials and hardware; construction industry occupations and employability skills; and an introduction to computer aided design software to set the foundation for a career in construction management.

CTE Standards and Benchmarks	
01.0	Demonstrate safety practices and follow disaster plans. The student will be able to:
01.01	Observe and comply with all applicable company and organizational safety policies and Occupational Safety and Health Administration (OSHA) rules and regulations.
01.02	Evaluate workplace/jobsite activities for compliance with governmental and other applicable safety regulations such as EPA and OSHA.
01.03	Be able to demonstrate the purpose of Safety Data Sheets (formerly known as Material Safety Data Sheets (MSDS)) and follow the procedures as necessary.
01.04	Discuss, analyze, and explain the "Right– to– Know" Law as recorded in (29 CFR–1910.1200).
01.05	Identify and demonstrate the use of safety equipment such as fall arrest systems, fire extinguishers, scaffolds, and ladders.
01.06	Identify workplace/jobsite environmental hazards of a given situation.
01.07	Identify, interpret, and follow disaster plans.
01.08	Describe and demonstrate appropriate safety attitudes and behaviors in the shop and on the job in the construction industry.
01.09	Describe and demonstrate the appropriate safe use and maintenance of portable and stationary power equipment in the shop and on the job in construction industry.
01.10	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments and meet insurance company policies.
01.11	Identify universal signs and symbols, such as colors, flags, stakes, and hand signals that apply to construction worksite situations.
01.12	Identify health– related problems that may result from exposure to work– related chemicals and hazardous materials and demonstrate knowledge of the proper precautions required for handling such materials. (Refer to Safety Data Sheets.)
02.0	Identify and safely use basic hand tools and power tools and describe their proper operation. The student will be able to:

	02.01 Select and utilize appropriate hand tools typically used in the construction industry for specific tasks in accordance with safety guidelines and standard practice.
	02.02 Select and utilize appropriate power tools and equipment for specific tasks in accordance with safety guidelines.
03.0	Understand construction components, materials, hardware, and characteristics. The student will be able to:
	03.01 Identify, classify, research, and present the various components, materials and hardware used in residential construction applications.
	03.02 Identify, classify, research, and present the various components, materials and hardware used in commercial construction applications.
	03.03 Identify, classify, research, and present the various components, materials and hardware used in industrial construction applications.
	03.04 Identify major types and components of construction equipment to select the appropriate option that works best for site development.
04.0	Use vocabulary, symbols, and formulas commonly used in design and construction. The student will be able to:
	04.01 Match vocabulary and visual cues to workplace/jobsite situations.
	04.02 Utilize vocabulary and visual cues in context of design and construction situations.
	04.03 Apply formulas commonly used in design and construction.
	04.04 Understand vocabulary used in construction request for proposals (RFP's).
05.0	Demonstrate a basic understanding of computer-aided design (CAD) software. The student will be able to:
	05.01 Demonstrate the basic use of computer– aided design software.
	05.02 Demonstrate the use of computer aided drafting (CAD) software to prepare project drawings.
06.0	Demonstrate rough carpentry skills and masonry processes. The student will be able to:
	06.01 Using design software, design a basic carpentry project.
	06.02 Using design software, design a basic masonry application.
	06.03 Using hand and power tools and emerging technology, build a basic carpentry and/or masonry project from design.
	06.04 Read, interpret, and apply measurements, drawings, and specifications to building projects.
07.0	Demonstrate electrical rough in skills. The student will be able to:
	07.01 Identify and apply electrical safety practices and procedures when working with electrical systems. (Refer to NFPA70E standards.)

	07.02 Explain and describe various phases of electrical generation and the transportation and distribution of electricity to and from sub stations for industrial, business and residential uses (under 480 volts).
	07.03 Design and calculate electrical loads using ohms law to determine power, American wire gauge (A WG) and electrical equipment sizes.
	07.04 Apply basic electrical theory to wiring a project.
	07.05 Design and install a branch circuit system in a project.
	07.06 Explain grounding, its purpose and relation to electrical safety.
	07.07 Install Ground Fault Circuit Interrupter (GFCI) circuitry.
	07.08 Understand the different types of wire and applications of each wire type.
08.0	Demonstrate heating, ventilation, and air-conditioning (HVAC) rough in skills. The student will be able to:
	08.01 Explain heating and cooling principles and code requirements.
	08.02 Perform basic calculations for heating and cooling loads.
	08.03 Develop an understanding of building envelope, insulation, and ventilation.
09.0	Demonstrate finishing carpentry skills. The student will be able to:
	09.01 Understand process of installing drywall and apply finishing techniques.
	09.02 Understand process of installing cabinets and built– in fabrications.
	09.03 Calculate and install window, door, floor and ceiling trim.
	09.04 Calculate, layout and install suspended ceilings.
10.0	Explain all that the built environment encompasses. The student will be able to:
	10.01 Research the development of construction technology, its impact on the built environment and the impact of growth on the construction industry.
	10.02 Describe and give examples of the influences and benefits of the construction industry on health and safety, communication, transportation and the economy.
	10.03 Examine and compare the relationship between the built environment and the natural environment.
	10.04 Analyze changes in architectural styles and construction practices over time relative to various environments.
	10.05 Describe the significance of major architects, engineers, or inventors to understand their historical influences.

	10.06	Research innovative historical architectural and/or engineering works and examine the significance of their legacy for the future.
	10.07	Identify transitions in design media, technique and focus to explain how technology has changed design throughout history.
	10.08	Explore new technology as it applies to the construction industry in terms of materials, processes, and the need for continuing education.
	10.09	Compare and analyze traditional and digital media to learn how technology has altered opportunities for innovative responses and results.
	10.10	Compare architectural designs and/or models to understand how technical and utilitarian components impact aesthetic qualities.
11.0	Compare and contrast the building systems and components. The student will be able to	
	11.01	Identify building systems needed to complete a construction project.
	11.02	Identify components of building systems needed to complete a project.
	11.03	Incorporate appropriate building systems into a construction project.
	11.04	Evaluate primary building systems including structure, structural engineering concepts, and environmental systems that are integrated within the building project.
12.0	Explain the importance of employability and entrepreneurship skills. The student will be able to:	
	12.01	Research an entrepreneur of interest and/or a known expert in the field of architecture, construction and engineering and present the impact his or her accomplishments have had on society and how coursework prepares students to impact their community and the world.
	12.02	Create a career portfolio to document knowledge, skills and experience.
	12.03	Use effective communication skills and strategies (listening, speaking, reading, writing, and graphic communications) to work with clients and colleagues.

Florida Department of Education
Student Performance Standards

Course Title: **Construction Design and Technique**
Course Number: **8104620**
Course Credit: **1**

Course Description:

This course introduces students to the skills necessary to design and plan a construction project. This includes the steps of a RFP, construction contracts, and the use of computer aided design software techniques.

CTE Standards and Benchmarks	
13.0	Develop a basic understanding of construction contracts and how they apply to the construction process. The students will be able to:
13.01	Explain the purpose and components of contracts, drawings, documents, and specifications and explain their relation to building permits.
13.02	Analyze the importance of building codes and zoning regulations on the development of drawings and specifications.
14.0	Develop analogical reasoning to identify and propose solutions in construction projects. The student will be able to:
14.01	Interpret and analyze architectural drawings (site plans, foundation plans, floor plans, interior/exterior elevations, sections, details, and schedules).
14.02	Discuss analogous features and architectural renderings.
14.03	Utilized specialized design software to develop a basic blueprint, including building symbols, drawing lines, abbreviations, and architectural and engineering scales.
15.0	Understand the Request for Proposal (RFP) process. The student will be able to:
15.01	Identify and distinguish among architecture, construction trades and management, and engineering occupations and describe how relationships and hierarchy of these careers facilitate smooth workflow and outcome to meet project goals.
15.02	Review example construction Requests for Proposals (RFP) and identify key roles and responsibilities.
15.03	Review example construction Requests for Proposals (RFP) and identify key components.
16.0	Read, interpret, and use technical drawings, documents, and specifications to plan a project. The student will be able to:
16.01	Interpret drawings used in project planning.
16.02	Read and interpret approved plans and specifications for residential and commercial drawings.
16.03	Recognize how specifications and standards are arranged for proper access.

	16.04 Use architect's plan, manufacturer's illustrations, and other materials to communicate specific data and visualize proposed work.
	16.05 Describe the written standards and specifications that apply.
	16.06 Demonstrate the basic use of computer– aided design software.
	16.07 Demonstrate the use of computer aided drafting (CAD) software to prepare project drawings.
17.0	Demonstrate an understanding of the process of selecting interior and exterior design elements. The student will be able to:
	17.01 Identify, describe, and use various painting tools and equipment.
	17.02 Prepare surfaces for application of finishes.
	17.03 Identify and describe various painting and application techniques.
	17.04 Apply finishes to a project including primers, paints, stains varnishes, wall coverings and textures.
	17.05 Use appropriate techniques and materials for clean up and tool and material storage.
	17.06 Research renewable fuels and energy.
	17.07 Assess molecular action as a result of temperature extremes, chemical reaction and moisture content as it relates to the choice of materials and construction techniques.
18.0	Explain the importance of employability and entrepreneurship skills. The students will be able to:
	18.01 Employ creativity skills in constructing scientific questions, methods and explanations.

Florida Department of Education
Student Performance Standards

Course Title: **Construction Project Management**
Course Number: **8104630**
Course Credit: **1**

Course Description:

This course provides students with an understanding of the role of a construction project manager. Students will learn project planning, cost-estimating, building codes, and design needs.

CTE Standards and Benchmarks	
19.0	Participate in the conceptual development of a construction project and oversee its organization, scheduling, budgeting, and implementation. The student will be able to:
19.01	Understand building science of thermal and moisture protection and mitigating measures.
19.02	Compare and contrast various roofing applications and justify the appropriate application for a conceptualized project.
19.03	Compare and contrast various windows and interior/exterior doors and associated hardware and justify the appropriate application for a conceptualized project.
19.04	Compare and contrast various exterior finishes and justify the appropriate application for a conceptualized project.
19.05	Analyze a survey and develop site layout.
20.0	Apply building code, laws, and rules in the design and construction of projects. The student will be able to:
20.01	Explain how the Americans with Disabilities Act influences the compliance requirements for project designs.
20.02	Design project plans that comply with OSHA standards.
21.0	Identify the diversity of needs, values, and social patterns in project design, including accessibility standards, to appropriately meet client needs. The student will be able to:
21.01	Identify the geographic and cultural issues related to project design in a given situation.
21.02	Participate in appropriate trade and professional associations.
21.03	Identify the diverse roles that utilize individual talents when working as members of a team.
21.04	Use effective communication skills and strategies (listening, speaking, reading, writing, and graphic communications) to work with clients and colleagues.
22.0	Demonstrate mathematics knowledge and skills through the process of project planning and cost estimating to create a budget. The

	students will be able to:
	22.01 Understand the requirements necessary to obtain a subcontractor bid.
	22.02 Calculate man hours and labor costs for a specific job.
	22.03 Prepare lists of materials and specifications.
	22.04 Estimate resources/materials required for a specific project or problem.
	22.05 Create a budget.
	22.06 Identify types of contract deliverables such as Design–Built, Cost Plus, and Construction Manager at Risk.
	22.07 Use available resources/materials effectively while completing a project or resolving a problem with a project plan.
	22.08 Evaluate waste of resources/materials.
	22.09 Evaluate necessity for additional resources/materials.
	22.10 Analyze and apply data and measurements to solve problems and interpret documents.
23.0	Understand contractual relations with all parties involved in the building process to ensure successful build of a project. The student will be able to:
	23.01 Establish/implement reporting relationships among stakeholders.
	23.02 Create sustainable and accountable partnerships between stakeholders.
	23.03 Describe the contracting process to include contract development, the bid process, payment terms, planning approvals, and limitations of liability.
	23.04 Describe the role that each stakeholder (owner, contractor, subcontractor, Architect of Record (AOR), Engineer of Record (EOR)) will assume to ensure successful completion of the project.
24.0	Understand approval procedures to ensure effective flow of information in the construction process. The student will be able to:
	24.01 Identify the components necessary for developing submittal approval procedures system in a timely fashion.
	24.02 Employ procedures, such as RFIs, that complete submittal approval process related to shop drawings.
	24.03 Employ procedures that complete submittal approval process related to state and local permits.
25.0	Use architecture and construction skills to create and manage a project through the use of a developed RFP. The student will be able to:
	25.01 Develop and manage the schedule of a project/job.

	25.02 Explain rationale for a specific scheduling procedure.
	25.03 Identify timeline required to complete a project/job and manage it throughout completion.
	25.04 Evaluate efficiency and effectiveness of a project/job.
	25.05 Adjust project plans to reflect an unexpected change.
	25.06 Determine alternative solutions for a specific project/problem.
	25.07 Plan, organize, schedule, and manage a project/job to optimize workflow and outcome utilizing industry recognized software.
	25.08 Describe the relationship between scheduling, risk assessment, and cost estimating to the success of the project.
26.0	Manage relationships with internal and external parties to successfully complete construction. The student will be able to:
	26.01 Describe strategies used to promote collaboration, trust and clear communication among contractors, suppliers, clients, and others on a jobsite.
27.0	Understand and implement testing and inspection procedures to ensure successful completion. The student will be able to:
	27.01 List testing and inspection procedures related to specific areas.
	27.02 Interpret guides designed for testing and inspection purposes in specific areas.
	27.03 Explain the benefits of using an external contractor to conduct the testing and inspection on the different phases of a build project.
	27.04 Explain the process of closing out a project including commissioning, closeout documents, contractual obligations, and a punch– list.
28.0	Explain the importance of employability and entrepreneurship skills. The students will be able to:
	28.01 Maintain a career portfolio to document knowledge, skills and experience.
	28.02 Research and present preplanning and procedural steps to accomplish various projects large and small both in the lab and on the job site with attention to building codes, standard practice and acceptable techniques.

Florida Department of Education
Student Performance Standards

Course Title: **Entrepreneurship in Architecture, Construction, and Engineering**
Course Number: **8104640**
Course Credit: **1**

Course Description:

This course will prepare students with the entrepreneurial background and skills necessary for starting a business in architecture, construction, or engineering.

CTE Standards and Benchmarks	
29.0	Discuss the role of the entrepreneur in the architecture, construction, and engineering fields. The student will be able to:
29.01	Define entrepreneurship.
29.02	Describe the differences between a product– based business and a service– based business.
29.03	Discuss future prospects for entrepreneurship and its anticipated impact on the economy.
29.04	Discuss the role of the entrepreneur in his/her local community (e.g., mentoring, philanthropy, etc.).
30.0	Discuss entrepreneurship in the fields of architecture, construction, and engineering as a career choice. The student will be able to:
30.01	Identify the education, aptitudes, and skills recommended for entrepreneurs.
30.02	Discuss the advantages and disadvantages of self– employment.
30.03	Identify resources available to entrepreneurs.
31.0	Identify the basic economic principles of entrepreneurship in the fields of architecture, construction, and engineering. The student will be able to:
31.01	Define and discuss profit motive and its impact on business.
31.02	Identify the different types of competition and explain the impact of competition on businesses (e.g., direct, indirect, price, non-price, competitive position, etc.).
31.03	Describe the differences between industrial and consumer goods.
31.04	Define land, labor, capital, and entrepreneurship as factors of production.
31.05	Discuss major fields of business activity (e.g., extractive, subcontracting, manufacturing, wholesaling, retailing, services, cottage industries, urban street sales, etc.).

31.06	Discuss the four parts of a business (i.e., production, finance, marketing, customer service).
31.07	Identify factors that contribute to the success of a small business.
31.08	Describe the process of starting a small business.
31.09	Explain the procedures for registering a sole proprietorship and obtaining a sales tax identification number.
31.10	Discuss reasons for small business failure; develop an exit strategy and plan.
32.0	Outline and present the steps in planning a new architecture, construction, or engineering business. The student will be able to:
32.01	Discuss the importance of "defining" a prospective business.
32.02	List reasons for writing a business plan.
32.03	Identify and describe the components of a business plan.
32.04	Describe the importance of a vision/mission statement in identifying the direction and objectives of a business.
32.05	Discuss the importance of determining what products and services will be offered by the business.
32.06	Identify how the scope of products and services will vary based on type of business (e.g., wholesale, retail, service, etc.).
32.07	Explain the importance of and the factors influencing the image of a business.
32.08	Identify and discuss the legal forms of business ownership (e.g., sole proprietorship, partnership, corporation, franchise, licensing, etc.).
32.09	Identify and discuss different types of corporations.
32.10	Identify factors that influence the choice of ownership type.
32.11	Describe the legal implications and taxes for each type of business structure.
32.12	Demonstrate the ability to manage accounts receivable.
32.13	Discuss the internal organization of a business and the assignment of tasks to be performed.
32.14	Discuss the different types of organization charts.
32.15	Describe different types of records needed by small businesses.
32.16	Identify factors that affect purchasing.
32.17	Explain the types and importance of inventory control.

	32.18 Identify the procedures to be followed in shipping and receiving (i.e., channels of distribution).
	32.19 Describe the role of selling in small business.
	32.20 Identify sources of assistance when planning a business [e.g., Small Business Development Center (SBDC), Small Business Administration (SBA), Chamber of Commerce, Service Corp of Retired Executives (SCORE), etc.].
33.0	Understand the purpose and application of SWOT Analysis. The students will be able to:
	33.01 Identify potential strengths of a business decision and positive attributes of a company.
	33.02 Identify potential weaknesses of a business decision and negative attributes of a company.
	33.03 Identify opportunities of a business environment that could contribute to its success.
	33.04 Identify potential threats to a company that could negatively impact a business.
34.0	Identify the principles of marketing an architecture, construction, or engineering business. The student will be able to:
	34.01 Define and explain market, market research, market mix, market positioning, market penetration strategy, market segmentation, market share, target market, and customer profile survey.
	34.02 Identify the components of a marketing plan.
35.0	Identify the principles of selling as it relates to the architecture, construction, and engineering fields. The student will be able to:
	35.01 Discuss the principles of selling.
	35.02 Identify the stages of selling (i.e., attention, interest, desire, action).
	35.03 Discuss the importance of customer service.
36.0	Identify the principles of financing. The student will be able to:
	36.01 Explain the difference between income (credit) and expense (debit).
	36.02 Discuss the importance of maintaining an accounting journal.
	36.03 Discuss the personal risks involved in financing a business.
	36.04 Define invoice, balance sheet, equity capital, debt capital, income statement, financial ratios, line of credit, collateral, factoring, income (i.e. earned and unearned), cash flow analysis statement, return on investment, return on equity, and chart of accounts.
	36.05 Explain the importance of financial accounting and management.
	36.06 Identify start– up costs and operating expenses (fixed and variable) for a new business.

	36.07 Identify sources of funds for financing a new business.
	36.08 Discuss the impact of interest rates on short-term and long-term financing.
	36.09 Describe methods for establishing credit and obtaining a credit card.
	36.10 Define *crowd sourcing.*
	36.11 Identify sources of credit and list the steps to apply for a loan.
	36.12 Define credit rating; *d*iscuss the importance of maintaining a favorable credit rating.
	36.13 Describe the differences between short-term and long-term capital needs.
	36.14 Identify circumstances that could require additional financing.
	36.15 Describe the differences between cash basis and accrual basis accounting.
	36.16 Identify the differences between bookkeeping, tax accounting, and managerial accounting.
	36.17 Understand the importance of managing cash flow.
37.0	Identify the types and sources of government regulations and taxation that may affect an architecture, construction, or engineering business. The student will be able to:
	37.01 Define license, permit, contract, patent, copyright, trademark, and logo.
	37.02 Identify the major state laws affecting the operation of a business.
	37.03 Identify the major federal laws affecting the operation of a business (e.g., OSHA, Social Security, EEOC, Affirmative Action, ADA, FMLA, etc.).
	37.04 Identify types of federal, state, and local taxes that are the responsibility of the entrepreneur (e.g., sales, income, and self-employment, etc.).
	37.05 Discuss the importance of obtaining outside professional counsel to ensure compliance with government regulations and taxation (e.g., accountant, lawyer, etc.).
38.0	Explain the importance of employability and entrepreneurship skills in the architecture, construction, and engineering fields. The students will be able to:
	38.01 Develop a business plan for a conceptual construction project and oversee its organization, scheduling, budgeting, and implementation.
	38.02 Present business plan using effective communication skills and strategies (listening, speaking, reading, writing, and graphic communications).
	38.03 Identify and utilize resources used in a job search (e.g., networking, newspaper, Internet).
	38.04 Discuss the importance of drug testing and criminal background checks in identifying possible employment options.

	38.05	Identify steps in the job application process; include references and proper documentation.
	38.06	Identify procedures and documents required to apply for a job (e.g., application, W-4, I-9, etc.).
	38.07	Prepare a résumé, letter of application, follow-up letter, acceptance/rejection letter, letter of resignation, and letter of recommendation.
	38.08	Identify and demonstrate appropriate dress and grooming for employment.
	38.09	Identify and demonstrate effective interviewing skills.
	38.10	Identify the qualities typically required for promotion (e.g., productivity, dependability, responsibility, etc.).
	38.11	Create and maintain a portfolio of documents for job placement (e.g., résumé, letters of recommendation, awards, evidence of participation in school/community/volunteer activities, employer evaluations, etc.).
	38.12	Discuss the importance of practicing positive customer service skills.
	38.13	Demonstrate the ability to collaborate with others in the workplace.
	38.14	Lead and manage conference calls and/or meetings.
	38.15	Create an agenda for a meeting or a conference.
39.0	Understand the roles and responsibilities among trades and professions including labor/management relationships. The student will be able to:	
	39.01	Analyze a proposed contract in terms of the company's position and union's position in labor contract negotiations.
	39.02	Assess a situation for compliance with terms of a contract.
	39.03	Discuss the role and responsibilities among the trades/professions in the work environment.
40.0	Research laws applicable to the construction industry. The student will be able to:	
	40.01	Identify governmental regulations and national, state, and/or local building codes that apply to a given workplace/jobsite.
	40.02	Discuss and analyze the governmental law process at the federal, state and local level and its impact on the construction industry and construction education.
	40.03	Identify and analyze the Codes of Federal Regulations (CFR) pertaining to the construction industry.
	40.04	Analyze the Florida State Statues pertaining to the construction industry.
	40.05	Compare and contrast trade union and trade non-union workers in terms of their effect and influence on health and safety, communication, transportation and the economy.
	40.06	Compare and contrast employment and training with union and non-union entities in the construction industry.

40.07	Assess the relationship between the Department of Labor and new construction projects, new permits and new business start-ups.
40.08	Examine and analyze the process of applying for building permits and variances.
40.09	Understand zoning and assess the need for and impact of zoning requirements on construction projects.
40.10	Research and assess the Florida Department of Business and Professional Regulation.
40.11	Research various construction occupations and explain the requirements for becoming licensed.
40.12	Compare and contrast the roles and responsibilities of the engineers, architects/ designers and the general contractor.
40.13	Compare and contrast the roles and responsibilities of the general contractor, subcontractors, specialty contractors and employees of contractors.
40.14	Identify and differentiate the roles and responsibilities of building construction firms and classifications of construction projects.
40.15	Differentiate between the insurance and bonding requirements of a prime contractor and subcontractor

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.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

Skills USA is the co-curricular career and technical student organization(s) 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.

Cooperative Training – OJT

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

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. 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 IEP served in Exceptional Student Education (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 and regulated secondary programs 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 course or a modified course. 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 a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. 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.

Florida Department of Education
Curriculum Framework

Program Title: **Plumbing**
Program Type: **Career Preparatory**
Career Cluster: **Architecture & Construction**

Secondary – Career Preparatory	
Program Number	8105500
CIP Number	0646050311
Grade Level	9-12
Program Length	4 Credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-3015 – Helpers - Pipelayers, Plumbers, Pipefitters, and Steamfitters 47-2152 -- Plumbers, Pipefitters, and Steamfitters
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of the programs in this cluster is to prepare students for employment or advanced training in a variety of pipe 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 reading construction documents, understanding building codes in the pipe trades, plumbing pipe cutting and joining skills and plumbing layout and installation.

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 totaling four credits.

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

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8721610	Plumbing Technology 1	PLUMBIN @7 7G BLDG CONST ¶ 7 ¶ G TEC CONSTR ¶ 7 ¶ G	1 Credit	47-3015	2	CT
8721620	Plumbing Technology 2		1 Credit		2	CT
8721630	Plumbing Technology 3		1 Credit	47-2152	2	CT
8721640	Plumbing Technology 4		1 Credit		2	CT

(Graduation Requirement Codes: CT= Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA= Mathematics, PL= Personal Financial Literacy)

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

3. Attend to personal health and financial well being.

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

Plumbing Technology 1

01.0 Describe career and training opportunities in the pipe trade industry.
02.0 Demonstrate a basic knowledge of the pipe trade industry.
03.0 Identify the use and care of basic tools in the pipe trade industry.
04.0 Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
05.0 Demonstrate basic mathematics knowledge and skills.

Plumbing Technology 2

06.0 Demonstrate science and additional mathematics knowledge and skills.
07.0 Read and interpret construction documents.
08.0 Demonstrate knowledge of basic plumbing skills.
09.0 Cut and join pipes.
10.0 Layout and install or (*Optional)* discuss and simulate, the installation of the first rough (underground).
11.0 Layout and install or (*Optional)* discuss and simulate, the installation of the second rough (first floor and above).
12.0 Layout and install or *(Optional)* discuss and simulate trim out plumbing.
13.0 Repair, service and maintain plumbing systems.

Plumbing Technology 3

14.0 Cut and join pipes.
15.0 Read and interpret construction documents and specifications and draw sketches.
16.0 Layout and coordinate a job.
17.0 Layout and install or *(Optional)* discuss and simulate, the installation of the first rough (underground).
18.0 Layout and install or *(Optional)* discuss and simulate, the installation of the second rough (first floor and above).
19.0 Layout and install or *(Optional)* discuss and simulate trim out plumbing.
20.0 Discuss and simulate the installation of water heating and circulating systems.
21.0 Explain the principles of backflow and cross connection control.
22.0 Repair, service and maintain plumbing systems.

Plumbing Technology 4

23.0 Read and interpret current pipe trade codes.
24.0 Demonstrate knowledge of plumbing codes.
25.0 Layout and install or *(Optional)* discuss and simulate, the installation of the first rough (underground).
26.0 Layout and install or *(Optional)* discuss and simulate, the installation of the second rough (first floor and above).
27.0 Layout and install or *(Optional)* discuss and simulate trim out plumbing.
28.0 Discuss and simulate the installation of water heating and circulating systems.

29.0 Explain the principles of backflow and cross connection control.
30.0 Repair, service and maintain plumbing systems.
31.0 Explain the importance of employability and entrepreneurship skills.

Florida Department of Education
Student Performance Standards

Course Title: **Plumbing Technology 1**
Course Number: **8721610**
Course Credit: **1**

Course Description:

The purpose of this course is to develop the competencies essential to pipe trades. These competencies relate to career and training opportunities, the use and care of tools and safety precautions.

CTE Standards and Benchmarks	
01.0	Describe career and training opportunities in the pipe trade industry. The student will be able to:
01.01	Obtain information on current and future job opportunities in the pipe trade industry and discuss its trends.
01.02	Describe career ladders (entry, intermediate and technical level careers) in each of the pipe trade industry programs and preparation requirements.
01.03	Describe advanced training opportunities including apprenticeship programs in each of the pipe trade industry programs.
02.0	Demonstrate a basic knowledge of the pipe trade industry. The student will be able to:
02.01	Discuss the history of pipe trades.
02.02	Identify pipes, fittings, materials, and equipment related to the pipe trades.
02.03	Identify fixtures and appliances for plumbing, fire sprinkler fitting, pipe fitting and gas fitting jobs.
02.04	Define the terms used in the pipe trade industry.
03.0	Identify the use and care of basic tools in the pipe trade industry. The student will be able to:
03.01	Identify and use the basic tools, equipment, and materials of the pipe trade industry.
03.02	Demonstrate the procedures/techniques for the selection, use, care and storage of tools and equipment.
03.03	Compare the various tools used for plumbing and pipe fitting.
03.04	Identify tools and equipment and the safety hazards associated with them.
03.05	Read and interpret measuring devices.

CTE Standards and Benchmarks	
04.0	Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
04.01	Explain the importance of following safety precautions when working in the pipe trade industry.
04.02	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
04.03	Observe safety precautions.
04.04	Identify safe working practices and safe working conditions in the pipe trade industry.
04.05	Explain emergency procedures to follow in response to workplace accidents.
04.06	Demonstrate Cardiopulmonary Resuscitation (CPR) techniques. (Optional)
04.07	Demonstrate an understanding of when and how to use first aid.
04.08	Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200). (Optional)
04.09	Identify health related problems that may result from exposure to work related chemicals and hazardous materials and describe the proper precautions for handling such materials.
04.10	Discuss environmental concerns related to hazardous waste, chemical waste, and biological waste disposal. (Optional)
05.0	Demonstrate basic mathematics knowledge and skills. The students will be able to:
05.01	Solve problems for addition, subtraction, multiplication, division, as well as area and perimeter measurements for rectangles, squares, and cylinders, manually and *(Optional)* with the use of a calculator.
05.02	Measure tolerances on horizontal and vertical surfaces using feet and inches, fractions of inches, and *(Optional)* using millimeters and centimeters.

Florida Department of Education
Student Performance Standards

Course Title: **Plumbing Technology 2**
Course Number: **8721620**
Course Credit: **1**

Course Description:

The purpose of this course is to develop the competencies essential to pipe trades. These competencies relate to reading construction documents and understanding standards and codes.

CTE Standards and Benchmarks	
06.0	Demonstrate science and additional mathematics knowledge and skills. The student will be able to:
06.01	Explain pressure measurement in terms of Pounds per Square Inch (PSI), inches of mercury and Kilopascal (KPA).
06.02	Explain how to use alternating current meters and instruments in the pipe trades.
06.03	Solve problems for volume, weight, and circumference measurements for cylinders, manually and *(Optional)* with the use of a calculator. (Optional)
06.04	Measure tolerances on horizontal and vertical surfaces using feet and inches, fractions of inches, and *(Optional)* using millimeters and centimeters.
06.05	Solve pipe trade related basic math problems, such as piping offsets, head pressure, PSI, pressure loss, slope, flow, etc. and *(Optional)* using metric conversion.
06.06	Perform plumbing math calculations by adding, subtracting, multiplying, and dividing, manually and *(Optional)* with the use of a calculator.
07.0	Read and interpret construction documents. The student will be able to:
07.01	Read and interpret measuring devices.
07.02	Identify the basic symbols used in the pipe trades.
07.03	Read and interpret manufacturer's schematics and specifications. (Optional)
07.04	Interpret roof drains, leaders, and drainage systems.
07.05	Analyze and apply data and measurements to solve problems and interpret documents. (Optional)
08.0	Demonstrate knowledge of basic plumbing skills. The student will be able to:
08.01	Explain the basic theory and principles of plumbing.

CTE Standards and Benchmarks	
	08.02 Identify:
	• Pipe and fitting
	• Pipe joining methods
	• Plumbing fixtures, appliances, materials, and equipment
	• Valves by type, size, materials, and application
	08.03 Solve pipe trade related basic math problems, such as piping offsets, head pressure, PSI, pressure loss, slope, flow, etc. and *(Optional)* using metric conversion.
	08.04 Perform plumbing math calculations by adding, subtracting, multiplying, and dividing, manually and *(Optional)* with the use of a calculator.
	08.05 Describe the effect of temperature and pressure changes, chemical reaction, and moisture content on various plumbing systems.
09.0	Cut and join pipes. The student will be able to:
	09.01 Join different types of pipes (including PVC, galvanized, steel, plastic, copper, and cast-iron pipes) according to plumbing codes and specifications using various methods including brazing (*Optional*), clamping, compression, threading, flange, flaring, gasket-joint, gluing and soldering.
	09.02 Measure, mark and cut different types of pipes using various methods.
	09.03 Thread a steel pipe by hand and with a power-driven vise stand or a pipe threading machine. (Optional)
	09.04 Demonstrate proficiency in using the tools, following safety practices and procedures.
10.0	Layout and install or *(Optional)* discuss and simulate, the installation of the first rough (underground). The student will be able to:
	10.01 Layout and install or *(Optional)* discuss and simulate the layout of an underground plumbing system. Establish a starting point according to codes and specifications. Explain the importance of coordinating with other crafts.
	10.02 Layout and install or *(Optional)* discuss and simulate the installation of the building drain, waste, vent, storm drainage and water heating and circulating systems.
	10.03 Layout and install or *(Optional)* discuss and simulate the installation of distribution systems.
	• Solve pipe trade related basic math problems, such as piping offsets, head pressure, PSI, pressure loss, slope, flow, etc., and (Optional) using metric conversion.
	• Perform plumbing math calculations by adding, subtracting, multiplying manually and (Optional) with the use of a calculator.
	10.04 Layout and install or *(Optional)* discuss and simulate the installation of a temporary water service with backflow prevention.
	10.05 Layout and install or *(Optional)* discuss and simulate the testing and inspection of the first rough.

CTE Standards and Benchmarks	
11.0	Layout and install or *(Optional)* discuss and simulate, the installation of the second rough (first floor and above). The student will be able to:
11.01	Layout and install or *(Optional)* discuss and simulate the installation and layout of a job for the first floor and above according to codes and specifications. Explain the importance of coordinating with other crafts.
11.02	Layout and install or *(Optional)* discuss and simulate the cutting of openings in walls and floors to accommodate the pipe and fittings.
11.03	Layout and install or *(Optional)* discuss and simulate the installation of hangers and supports.
11.04	Layout and install or *(Optional)* discuss and simulate the installation of the building drain, waste vent, storm drainage; and water heating and circulating systems.
11.05	Layout and install or *(Optional)* discuss and simulate the installation of distribution systems.
11.06	Layout and install or *(Optional)* discuss and simulate the testing and inspection of the second rough.
12.0	Layout and install or *(Optional)* discuss and simulate trim out plumbing. The student will be able to:
12.01	Layout and install or *(Optional)* discuss and simulate how to distribute and place fixtures, appliances, and equipment, including safety devices and control.
12.02	Layout and install or *(Optional)* discuss and simulate how to trim out and install job-site fixtures, appliances and equipment including closet flanges, supply stops on water pipes, lavatory, water closets, showers, kitchen sinks, garbage disposal, ice makers, dishwashers, and water heaters.
12.03	Install backflow assemblies as required.
12.04	Test and inspect the final installation.
13.0	Repair, service and maintain plumbing systems. The student will be able to:
13.01	Troubleshoot and diagnose plumbing systems.
13.02	Repair and replace water service and sanitary lines.
13.03	Repair and replace water closets, ball cocks, flush valves, floats, lift rods, ball stoppers and trip levers.
13.04	Repair leaks in traps and faucets.
13.05	Repair and replace sink strainers.
13.06	Repair and replace water heaters.
13.07	Replace and repair fixture water supply pipes.
13.08	Reseal water closets to flanges.

CTE Standards and Benchmarks
13.09 Test and inspect repaired systems.
13.10 Clear obstructions from kitchen sink, water closet, bathtub, lavatory, and sewer lines, using chemicals and tools.

Florida Department of Education
Student Performance Standards

Course Title: **Plumbing Technology 3**
Course Number: **8721630**
Course Credit: **1**

Course Description:

This course is designed to provide students with competencies relating to construction document and job specifications, building codes in the pipe trades, plumbing pipe cutting and joining skills.

CTE Standards and Benchmarks	
14.0	Cut and join pipes. The student will be able to:
14.01	Join different types of pipes (including PVC, galvanized, steel, plastic, copper and cast-iron pipes) according to plumbing codes and specifications using various methods including brazing (*Optional*), clamping, compression, threading, flange, flaring, gasket-joint, gluing and soldering.
14.02	Measure, mark and cut different types of pipes using various methods.
14.03	Thread a steel pipe by hand and with a power-driven vise stand or a pipe threading machine. (Optional)
14.04	Demonstrate proficiency in using the tools, following safety practices and procedures.
15.0	Read and interpret construction documents and specifications and draw sketches. The student will be able to:
15.01	Recognize and identify plumbing symbols.
15.02	Identify basic plumbing systems from the blueprint.
15.03	From the blueprints and specifications, identify the plumbing fixtures and materials required for the plumbing job.
15.04	Relate the blueprint to all applicable (local, state, and federal) plumbing codes.
15.05	Cross reference all working drawings to determine the location and elevation of the piping system and duct work.
15.06	Demonstrate trade related computer skills for blueprints and specifications.
15.07	Draw and interpret basic isometric sketches.
15.08	Read and interpret manufacturers' schematics and specifications.
15.09	Draw and interpret roof drains, leaders, and drainage systems.

CTE Standards and Benchmarks	
16.0	Layout and coordinate a job. The student will be able to:
16.01	Identify specifications.
16.02	Make a list of materials required to layout a job.
16.03	Determine the work aids required and the sequence of installations, according to building plans, specs and working drawings. (Optional)
17.0	Layout and install or *(Optional)* discuss and simulate, the installation of the first rough (underground). The student will be able to:
17.01	Layout and install or *(Optional)* discuss and simulate the layout of an underground plumbing system. Establish a starting point according to codes and specifications. Explain the importance of coordinating with other crafts.
17.02	Layout and install or *(Optional)* discuss and simulate the installation of the building drain, waste, vent, storm drainage and water heating and circulating systems.
17.03	Layout and install or *(Optional)* discuss and simulate the installation of distribution systems.
	• Solve pipe trade related basic math problems, such as piping offsets, head pressure, PSI, pressure loss, slope, flow, etc., and (Optional) using metric conversion.
	• Perform plumbing math calculations by adding, subtracting, multiplying manually and (Optional) with the use of a calculator.
17.04	Layout and install or *(Optional)* discuss and simulate the installation of a temporary water service with backflow prevention.
17.05	Layout and install or *(Optional)* discuss and simulate the testing and inspection of the first rough.
18.0	Layout and install or *(Optional)* discuss and simulate, the installation of the second rough (first floor and above). The student will be able to:
18.01	Layout and install or *(Optional)* discuss and simulate the installation and layout of a job for the first floor and above according to codes and specifications. Explain the importance of coordinating with other crafts.
18.02	Layout and install or *(Optional)* discuss and simulate the cutting of openings in walls and floors to accommodate the pipe and fittings.
18.03	Layout and install or *(Optional)* discuss and simulate the installation of hangers and supports.
18.04	Layout and install or *(Optional)* discuss and simulate the installation of the building drain, waste vent, storm drainage; and water heating and circulating systems.
18.05	Layout and install or *(Optional)* discuss and simulate the installation of distribution systems.
18.06	Layout and install or *(Optional)* discuss and simulate the testing and inspection of the second rough.
19.0	Layout and install or *(Optional)* discuss and simulate trim out plumbing. The student will be able to:
19.01	Layout and install or *(Optional)* discuss and simulate how to distribute and place fixtures, appliances, and equipment, including safety devices and control.

CTE Standards and Benchmarks	
	19.02 Layout and install or *(Optional)* discuss and simulate how to trim out and install job-site fixtures, appliances and equipment including closet flanges, supply stops on water pipes, lavatory, water closets, showers, kitchen sinks, garbage disposal, ice makers, dishwashers and water heaters.
	19.03 Install backflow assemblies as required.
	19.04 Test and inspect the final installation.
20.0	Discuss and simulate the installation of water heating and circulating systems. The student will be able to:
	20.01 Explain the basic theory of domestic water heating.
	20.02 Discuss and simulate how to design, size and layout a system.
	20.03 Discuss and identify the equipment and materials needed for the job in accordance with job specifications and plumbing codes.
	20.04 Discuss and simulate how to test and inspect the system.
21.0	Explain the principles of backflow and cross connection control. The student will be able to:
	21.01 Define backflow and cross connection control.
	21.02 Describe the importance of backflow and cross connection control to the health of the public.
	21.03 Identify the proper devices and assemblies for individual applications.
	21.04 Explain the "degree of hazard" principle and how it relates to the installation of devices and assemblies.
22.0	Repair, service and maintain plumbing systems. The student will be able to:
	22.01 Troubleshoot and diagnose plumbing systems.
	22.02 Repair and replace water service and sanitary lines.
	22.03 Repair and replace water closets, ball cocks, flush valves, floats, lift rods, ball stoppers and trip levers.
	22.04 Repair leaks in traps and faucets.
	22.05 Repair and replace sink strainers.
	22.06 Repair and replace water heaters.
	22.07 Replace and repair fixture water supply pipes.

CTE Standards and Benchmarks
22.08 Reseal water closets to flanges.
22.09 Test and inspect repaired systems.
22.10 Clear obstructions from kitchen sink, water closet, bathtub, lavatory, and sewer lines, using chemicals and tools.

Florida Department of Education
Student Performance Standards

Course Title: **Plumbing Technology 4**
Course Number: **8721640**
Course Credit: **1**

Course Description:

This course is designed to provide students with basics to layout and coordinate a job install the first, second rough and trim out plumbing

CTE Standards and Benchmarks	
23.0	Read and interpret current pipe trade codes. The student will be able to:
23.01	Describe the importance of following the local, state, and national codes for plumbing, gas fitting and/or pipe fitting.
23.02	Read and interpret current standards and codes for plumbing, gas fitting and/or pipe fitting, including the Florida Plumbing Code and the Florida Fuel Gas Code.
23.03	Read and interpret basic building codes in the pipe trade industry and demonstrate knowledge of key codes and definitions regarding: drain, waste, vent sizing, water heaters, wet venting, stack venting, bathroom groups, maximum distance from p-trap to vent, etc.
24.0	Demonstrate knowledge of plumbing codes. The student will be able to:
24.01	Describe and explain the purpose of plumbing codes.
24.02	Apply the basic theory and principles of plumbing in relation to the codes.
24.03	Read and locate information in the Florida Plumbing Code.
24.04	Define and explain the terms used in the plumbing codes.
24.05	Explain why the code may supersede the manufacturer's specifications.
25.0	Layout and install or *(Optional)* discuss and simulate, the installation of the first rough (underground). The student will be able to:
25.01	Layout and install or *(Optional)* discuss and simulate the layout of an underground plumbing system. Establish a starting point according to codes and specifications. Explain the importance of coordinating with other crafts.
25.02	Layout and install or *(Optional)* discuss and simulate the installation of the building drain, waste, vent, storm drainage and water heating and circulating systems.
25.03	Layout and install or *(Optional)* discuss and simulate the installation of distribution systems.
	• Solve pipe trade related basic math problems, such as piping offsets, head pressure, PSI, pressure loss, slope, flow, etc., and (Optional) using metric conversion.

CTE Standards and Benchmarks	
	• Perform plumbing math calculations by adding, subtracting, multiplying manually and (Optional) with the use of a calculator.
25.04	Layout and install or *(Optional)* discuss and simulate the installation of a temporary water service with backflow prevention.
25.05	Layout and install or *(Optional)* discuss and simulate the testing and inspection of the first rough.
26.0	Layout and install, or *(Optional)* discuss and simulate, the installation of the second rough (first floor and above). The student will be able to:
26.01	Layout and install or *(Optional)* discuss and simulate the installation and layout of a job for the first floor and above according to codes and specifications. Explain the importance of coordinating with other crafts.
26.02	Layout and install or *(Optional)* discuss and simulate the cutting of openings in walls and floors to accommodate the pipe and fittings.
26.03	Layout and install or *(Optional)* discuss and simulate the installation of hangers and supports.
26.04	Layout and install or *(Optional)* discuss and simulate the installation of the building drain, waste vent, storm drainage; and water heating and circulating systems.
26.05	Layout and install or *(Optional)* discuss and simulate the installation of distribution systems.
26.06	Layout and install or *(Optional)* discuss and simulate the testing and inspection of the second rough.
27.0	Layout and install or *(Optional)* discuss and simulate trim out plumbing. The student will be able to:
27.01	Layout and install or *(Optional)* discuss and simulate how to distribute and place fixtures, appliances, and equipment, including safety devices and control.
27.02	Layout and install or *(Optional)* discuss and simulate how to trim out and install job-site fixtures, appliances and equipment including closet flanges, supply stops on water pipes, lavatory, water closets, showers, kitchen sinks, garbage disposal, ice makers, dishwashers, and water heaters.
27.03	Install backflow assemblies as required.
27.04	Test and inspect the final installation.
28.0	Discuss and simulate the installation of water heating and circulating systems. The student will be able to:
28.01	Explain the basic theory of domestic water heating.
28.02	Discuss and simulate how to design, size and layout a system.
28.03	Discuss and identify the equipment and materials needed for the job in accordance with job specifications and plumbing codes.
28.04	Discuss and simulate how to test and inspect the system.
29.0	Explain the principles of backflow and cross connection control. The student will be able to:

CTE Standards and Benchmarks	
	29.01 Define backflow and cross connection control.
	29.02 Describe the importance of backflow and cross connection control to the health of the public.
	29.03 Identify the proper devices and assemblies for individual applications.
	29.04 Explain the "degree of hazard" principle and how it relates to the installation of devices and assemblies.
30.0	Repair, service and maintain plumbing systems. The student will be able to:
	30.01 Troubleshoot and diagnose plumbing systems.
	30.02 Repair and replace water service and sanitary lines.
	30.03 Repair and replace water closets, ball cocks, flush valves, floats, lift rods, ball stoppers and trip levers.
	30.04 Repair leaks in traps and faucets.
	30.05 Repair and replace sink strainers.
	30.06 Repair and replace water heaters.
	30.07 Replace and repair fixture water supply pipes.
	30.08 Reseal water closets to flanges.
	30.09 Test and inspect repaired systems.
	30.10 Clear obstructions from kitchen sink, water closet, bathtub, lavatory, and sewer lines, using chemicals and tools.
31.0	Explain the importance of employability and entrepreneurship skills. The students will be able to:
	31.01 Identify and demonstrate positive work behaviors needed to be employable.
	31.02 Develop personal career plan that includes goals, objectives, and strategies.
	31.03 Examine licensing, certification, and industry credentialing requirements.
	31.04 Maintain a career portfolio to document knowledge, skills, and experience.
	31.05 Evaluate and compare employment opportunities that match career goals.
	31.06 Identify and exhibit traits for retaining employment.

CTE Standards and Benchmarks	
31.07	Demonstrate an understanding of how to calculate basic operating costs for a fictitious small plumbing business, as well as deriving a profitable labor rate for that business.
31.08	Identify opportunities and research requirements for career advancement.
31.09	Research the benefits of ongoing professional development.
31.10	Examine and describe entrepreneurship opportunities as a career planning option.

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.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. 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 IEP served in Exceptional Student Education (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 and regulated secondary programs 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 course or a modified course. 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 a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. 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.

Florida Department of Education
Curriculum Framework

Course Title: **Introduction to Architecture & Construction**
Course Type: **Orientation/Exploratory**
Career Cluster: **Architecture & Construction**

Secondary – Middle School	
Course Number	8109350
CIP Number	148109350M
Grade Level	6-8
Course Length	Semester
Teacher Certification	Refer to the **Course Structure** section.
CTSO	SkillsUSA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this course is to assist students in making informed decisions regarding their future academic and occupational goals and to provide information regarding careers in the Architecture & Construction career cluster. The content includes but is not limited to careers in designing, planning, managing, building and maintaining the built environment. Reinforcement of academic skills occurs through classroom instruction and applied laboratory procedures.

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

Course Structure

The length of this course is one semester. It may be offered for two semesters when appropriate. When offered for one semester, it is recommended that it be at the exploratory level and more in-depth when offered for two semesters.

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

The following table illustrates the course structure:

Course Number	Course Title	Teacher Certification	Length
8109350	Introduction to Architecture & Construction	TEC ED 1@2 ENG&TEC ED1@2 BLDG CONST @7 7G BLDG MAINT @7 7G DRAFTING @7 7G	Semester

Standards

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

01.0 Demonstrate an understanding of the Design/ Pre-Construction career pathway.
02.0 Demonstrate an understanding of the Construction career pathway.
03.0 Demonstrate an understanding of the Maintenance/ Operation career pathway.
04.0 Apply leadership and communication skills.
05.0 Describe how information technology is used in the Architecture and Construction career cluster.
06.0 Use information technology tools.

Florida Department of Education
Student Performance Standards

Course Title: **Introduction to Architecture & Construction**
Course Number: **8109350**
Course Length: **Semester**

Course Description:

Beginning with a broad overview of the Architecture & Construction career cluster, students are introduced to the terminology, careers, history, required skills, and technologies associated with each pathway in the Architecture & Construction career cluster. Additionally, they will be provided with opportunities to acquire and demonstrate beginning leadership skills.

CTE Standards and Benchmarks	
01.0	Demonstrate an understanding of the Design/ Pre-Construction career pathway--The student will be able to:
01.01	Define and use proper terminology associated with the Design/ Pre-Construction career pathway.
01.02	Describe some of the careers available in the Design/ Pre-Construction career pathway.
01.03	Identify common characteristics of the careers in the Design/ Pre-Construction career pathway.
01.04	Research the history of the Design/ Pre-Construction career pathway and describe how the associated careers have evolved and impacted society.
01.05	Identify skills required to successfully enter any career in the Design/Pre-Construction career pathway.
01.06	Describe technologies associated in careers within the Design/ Pre-Construction career pathway.
02.0	Demonstrate an understanding of the Construction career pathway--The student will be able to:
02.01	Define and use proper terminology associated with the Construction career pathway.
02.02	Describe some of the careers available in the Construction career pathway.
02.03	Identify common characteristics of the careers in the Construction career pathway.
02.04	Research the history of the Construction career pathway and describe how the careers have evolved and impacted society.
02.05	Identify skills required to successfully enter any career in the Construction career pathway.
02.06	Describe technologies associated in careers within the Construction career pathway.

CTE Standards and Benchmarks	
03.0	Demonstrate an understanding of the Maintenance/ Operation career pathway--The student will be able to:
03.01	Define and use proper terminology associated with the Maintenance/ Operation career pathway.
03.02	Describe some of the careers available in the Maintenance/ Operation career pathway.
03.03	Identify common characteristics of the careers in the Maintenance/ Operation career pathway.
03.04	Research the history of the Maintenance/ Operation career pathway and describe how the careers have evolved and impacted society.
03.05	Identify skills required to successfully enter any career in the Maintenance/ Operation career pathway.
03.06	Describe technologies associated in careers within the Maintenance/ Operation career pathway.
04.0	Apply leadership and communication skills--The student will be able to:
04.01	Discuss the establishment and history of the SkillsUSA organization.
04.02	Identify the characteristics and responsibilities of organizational leaders.
04.03	Demonstrate parliamentary procedure skills during a meeting.
04.04	Participate in a committee which has an assigned task and report to the class.
04.05	Demonstrate effective communication skills through delivery of a speech, a slide presentation, or conducting a demonstration.
04.06	Use a computer to assist in the completion of a project related to the Architecture & Construction career cluster.
05.0	Describe how information technology is used in the Architecture and Construction career cluster. – The student will be able to:
05.01	Identify information technology (IT) careers in the Architecture and Construction career cluster, including the responsibilities, tasks and skills they require.
05.02	Relate information technology project management concepts and terms to careers in the Architecture and Construction career cluster.
05.03	Manage information technology components typically used in professions of the Architecture and Construction career cluster.
05.04	Identify security-related ethical and legal IT issues faced by professionals in the Architecture and Construction career cluster.
06.0	Use information technology tools. – The student will be able to:
06.01	Identify the functions of web browsers, and use them to access the World Wide Web and other computer resources typically used in the Architecture and Construction career cluster.

CTE Standards and Benchmarks	
06.02	Use e-mail clients to send simple messages and files to other Internet users.
06.03	Demonstrate ways to communicate effectively using Internet technology.
06.04	Use different types of web search engines effectively to locate information relevant to the Architecture and Construction career cluster.

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.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular career and technical student organization 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 as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. 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 IEP served in Exceptional Student Education (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 and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Course Title: **Introduction to Architecture & Construction and Career Planning**
Course Type: **Orientation/Exploratory**
Career Cluster: **Architecture & Construction**

Secondary – Middle School	
Course Number	8109360
CIP Number	148109360M
Grade Level	6-8
Course Length	Semester
Teacher Certification	Refer to the **Course Structure** section.
CTSO	SkillsUSA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this course is to assist students in making informed decisions regarding their future academic and occupational goals and to provide information regarding careers in the Architecture & Construction career cluster. The content includes but is not limited to careers in designing, planning, managing, building and maintaining the built environment. Reinforcement of academic skills occurs through classroom instruction and applied laboratory procedures.

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

Course Structure

The length of this course is one semester. It may be offered for two semesters when appropriate. When offered for one semester, it is recommended that it be at the exploratory level and more in-depth when offered for two semesters.

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

The following table illustrates the course structure:

Course Number	Course Title	Teacher Certification	Length
8109360	Introduction to Architecture & Construction and Career Planning	TEC ED 1@2 ENG&TEC ED1@2 BLDG CONST @7 7G BLDG MAINT @7 7G DRAFTING @7 7G	Semester

Standards

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

01.0 Demonstrate an understanding of the Design/ Pre-Construction career pathway.
02.0 Demonstrate an understanding of the Construction career pathway.
03.0 Demonstrate an understanding of the Maintenance/ Operation career pathway.
04.0 Apply leadership and communication skills.
05.0 Describe how information technology is used in the Architecture and Construction career cluster.
06.0 Use information technology tools.

Listed below are the standards that must be met to satisfy the requirements of Section 1003.4156, Florida Statutes:

07.0 Describe the influences that societal, economic, and technological changes have on employment trends and future training.
08.0 Develop skills to locate, evaluate, and interpret career information.
09.0 Identify and demonstrate processes for making short and long term goals.
10.0 Demonstrate employability skills such as working in a group, problem-solving and organizational skills, and the importance of entrepreneurship.
11.0 Understand the relationship between educational achievement and career choices/postsecondary options.
12.0 Identify a career cluster and related pathways through an interest assessment that match career and education goals.
13.0 Develop a career and education plan that includes short and long-term goals, high school program of study, and postsecondary/career goals.
14.0 Demonstrate knowledge of technology and its application in career fields/clusters.

Florida Department of Education
Student Performance Standards

Course Title: **Introduction to Architecture & Construction and Career Planning**
Course Number: **8109360**
Course Length: **Semester**

Course Description:

Beginning with a broad overview of the Architecture & Construction career cluster, students are introduced to the terminology, careers, history, required skills, and technologies associated with each pathway in the Architecture & Construction career cluster. Additionally, they will be provided with opportunities to acquire and demonstrate beginning leadership skills.

CTE Standards and Benchmarks	
01.0	Demonstrate an understanding of the Design/Pre-Construction career pathway--The student will be able to:
01.01	Define and use proper terminology associated with the Design/Pre-Construction career pathway.
01.02	Describe some of the careers available in the Design/Pre-Construction career pathway.
01.03	Identify common characteristics of the careers in the Design/Pre-Construction career pathway.
01.04	Research the history of the Design/Pre-Construction career pathway and describe how the associated careers have evolved and impacted society.
01.05	Identify skills required to successfully enter any career in the Design/Pre-Construction career pathway.
01.06	Describe technologies associated in careers within the Design/Pre-Construction career pathway.
02.0	Demonstrate an understanding of the Construction career pathway--The student will be able to:
02.01	Define and use proper terminology associated with the Construction career pathway.
02.02	Describe some of the careers available in the Construction career pathway.
02.03	Identify common characteristics of the careers in the Construction career pathway.
02.04	Research the history of the Construction career pathway and describe how the careers have evolved and impacted society.
02.05	Identify skills required to successfully enter any career in the Construction career pathway.
02.06	Describe technologies associated in careers within the Construction career pathway.

CTE Standards and Benchmarks	
03.0	Demonstrate an understanding of the Maintenance/Operation career pathway--The student will be able to:
03.01	Define and use proper terminology associated with the Maintenance/Operation career pathway.
03.02	Describe some of the careers available in the Maintenance/Operation career pathway.
03.03	Identify common characteristics of the careers in the Maintenance/Operation career pathway.
03.04	Research the history of the Maintenance/Operation career pathway and describe how the careers have evolved and impacted society.
03.05	Identify skills required to successfully enter any career in the Maintenance/Operation career pathway.
03.06	Describe technologies associated in careers within the Maintenance/Operation career pathway.
04.0	Apply leadership and communication skills--The student will be able to:
04.01	Discuss the establishment and history of the SkillsUSA organization.
04.02	Identify the characteristics and responsibilities of organizational leaders.
04.03	Demonstrate parliamentary procedure skills during a meeting.
04.04	Participate in a committee which has an assigned task and report to the class.
04.05	Demonstrate effective communication skills through delivery of a speech, a slide presentation, or conducting a demonstration.
04.06	Use a computer to assist in the completion of a project related to the Architecture & Construction career cluster.
05.0	Describe how information technology is used in the Architecture and Construction career cluster. – The student will be able to:
05.01	Identify information technology (IT) careers in the Architecture and Construction career cluster, including the responsibilities, tasks and skills they require.
05.02	Relate information technology project management concepts and terms to careers in the Architecture and Construction career cluster.
05.03	Manage information technology components typically used in professions of the Architecture and Construction career cluster.
05.04	Identify security-related ethical and legal IT issues faced by professionals in the Architecture and Construction career cluster.
06.0	Use information technology tools. – The student will be able to:
06.01	Identify the functions of web browsers, and use them to access the World Wide Web and other computer resources typically used in the Architecture and Construction career cluster.

CTE Standards and Benchmarks	
06.02	Use e-mail clients to send simple messages and files to other Internet users.
06.03	Demonstrate ways to communicate effectively using Internet technology.
06.04	Use different types of web search engines effectively to locate information relevant to the Architecture and Construction career cluster.
Listed below are the standards that must be met to satisfy the requirements of Section 1003.4156, Florida Statutes: The student will be able to**:**	
07.0	Describe the influences that societal, economic, and technological changes have on employment trends and future training.
08.0	Develop skills to locate, evaluate, and interpret career information.
09.0	Identify and demonstrate processes for making short and long term goals.
10.0	Demonstrate employability skills such as working in a group, problem-solving and organizational skills, and the importance of entrepreneurship.
11.0	Understand the relationship between educational achievement and career choices/postsecondary options.
12.0	Identify a career cluster and related pathways that match career and education goals.
13.0	Develop a career and education plan that includes short and long-term goals, high school program of study, and postsecondary/career goals.
14.0	Demonstrate knowledge of technology and its application in career fields/clusters.

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.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career Planning

Effective July 1, 2019, per Section 1003.4156, Florida Statutes (F.S.), for students to meet middle grades promotion requirements, a Career and Education Planning course must be completed in either sixth, seventh, or eighth grade. These courses should be taught integrating the eight career and education planning course standards.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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 as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. 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 IEP served in Exceptional Student Education (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 and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Course Title: **Fundamentals of Architecture and Construction**
Course Type: **Orientation/Exploratory**
Career Cluster: **Architecture and Construction**

Secondary – Middle School	
Course Number	8130300
CIP Number	148130300M
Grade Level	6-8
Course Length	Semester
Teacher Certification	Refer to the **Course Structure** section.
CTSO	SkillsUSA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this course is to assist students in making informed decisions regarding their future academic and occupational goals and to provide information regarding careers in the Architecture and Construction career cluster. The content includes but is not limited to investigating careers, reading and drawing plans and constructing models. Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

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

Course Structure

The length of this course is one semester. It may be offered for two semesters when appropriate. When offered for one semester, it is recommended that it be at the exploratory level and more in-depth when offered for two semesters.

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

The following table illustrates the course structure:

Course Number	Course Title	Teacher Certification	Length
8130300	Fundamentals of Architecture and Construction	TEC ED 1@2 ENG&TEC ED1@2 BLDG CONST @7 7G BLDG MAINT @7 7G DRAFTING @7 7G	Semester

Standards

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

01.0 Investigate careers and entry requirements within the design/ preconstruction pathway.
02.0 Use safe work practices.
03.0 Read and interpret basic construction documents and specifications.
04.0 Draw basic plans by hand.
05.0 Read civil, architectural and mechanical, electrical and plumbing (MEP) drawings.
06.0 Investigate careers and entry requirements within the construction pathway.
07.0 Plan the construction of a model or architectural detail from a set of plans.
08.0 Construct a model or architectural detail from plans and specifications.
09.0 Investigate careers and entry requirements within the operation and maintenance pathway.
10.0 Analyze the impact of design decisions on building operations and maintenance.
11.0 Explain sustainability issues related to the design, construction and maintenance of the built environment.
12.0 Identify components of network systems.
13.0 Describe and use communication features of information technology.

Florida Department of Education
Student Performance Standards

Course Title: **Fundamentals of Architecture and Construction**
Course Number: **8130300**
Course Length: **Semester**

Course Description:

The purpose of this course is to assist students in making informed decisions regarding their future academic and occupational goals and to provide information regarding careers in the Architecture and Construction career cluster. The content includes but is not limited to investigating careers, reading and drawing plans and constructing models.

CTE Standards and Benchmarks	
01.0	Investigate careers and entry requirements within the design/ preconstruction pathway--The student will be able to:
01.01	Describe careers in design/preconstruction (e.g., architects, interior designers, drafters, engineers - civil, MEP and structural, urban and regional planners, etc.)
01.02	Explain educational and training pathways necessary for these careers.
01.03	Research and present information on a design / preconstruction career including roles and responsibilities, opportunities for employment and the requirements for education and training.
02.0	Use safe work practices--The student will be able to:
02.01	Comply with all applicable basic Occupational Safety and Health Administration (OSHA) rules and regulations.
02.02	Use appropriate safety equipment.
02.03	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments and work ethics.
03.0	Read and interpret basic construction documents and specifications--The student will be able to:
03.01	Name various types of drawings used in construction documents and explain their purpose.
03.02	Locate sections, elevations and details indicated on the floor plan within the set of construction documents.
03.03	Select and use appropriate architectural scales for various drawings.
03.04	Identify various symbols and terminology used in construction documents.
03.05	Read and interpret specifications.

CTE Standards and Benchmarks	
	03.06 Explain the scope and purpose of building codes and regulations.
04.0	Draw basic plans by hand--The student will be able to:
	04.01 Draw plans and corresponding elevations, sections and details.
	04.02 Apply appropriate architectural scales to drawings.
	04.03 Apply basic building codes in drawings.
	04.04 Create door, window and finish schedules.
05.0	Read civil, architectural and mechanical, electrical and plumbing (MEP) drawings--The student will be able to:
	05.01 Locate civil plans within a construction documents set, identify defining features and state the importance of these plans.
	05.02 Locate architectural plans within a construction documents set, identify defining features and state the importance of these plans.
	05.03 Locate mechanical plans within a construction documents set, identify defining features and state the importance of these plans.
	05.04 Locate electrical plans within a construction documents set, identify defining features and state the importance of these plans.
	05.05 Locate plumbing plans within a construction documents set, identify defining features and state the importance of these plans.
	05.06 Name types of careers associated with the development of civil, architectural and mechanical, electrical and plumbing (MEP) drawings.
06.0	Investigate careers and entry requirements within the construction pathway--The student will be able to:
	06.01 Describe careers in design/preconstruction (e.g., managers - project managers, project engineers, estimators, superintendents; sub-contractors and tradespersons - carpenters, masons, electricians, plumbers, HVAC technicians; etc.)
	06.02 Explain educational and training pathways available for these careers.
	06.03 Research and present information on a construction career including roles and responsibilities, opportunities for employment and the requirements for education and training.
07.0	Plan the construction of a model or architectural detail from a set of plans--The student will be able to:
	07.01 Calculate material quantities and costs.
	07.02 Determine the critical path as a progression of construction activities.
	07.03 Draw a bar chart depicting construction schedule.

CTE Standards and Benchmarks	
08.0	Construct a model or architectural detail from plans and specifications--The student will be able to:
08.01	Use appropriate tools while demonstrating safe work practices.
08.02	Apply proper cutting and fastening techniques for basic model materials.
09.0	Investigate careers and entry requirements within the operation and maintenance pathway--The student will be able to:
09.01	Describe careers in operation and maintenance (energy auditors; building inspectors; system installers - HVAC, telecommunications, security/fire, solar, etc.; maintenance technicians; hazardous materials removers; environmental engineers).
09.02	Explain educational and training pathways necessary for these careers.
09.03	Research and present information on an operation and maintenance career including roles and responsibilities, opportunities for employment and the requirements for education and training.
10.0	Analyze the impact of design decisions on building operations and maintenance--The student will be able to:
10.01	Compare life-cycle costs for various building materials and/or systems within the built environment.
10.02	Explain maintenance procedures for specific products or materials.
11.0	Explain sustainability issues related to the design, construction and maintenance of the built environment--The student will be able to:
11.01	Describe the impact of the construction industry on the natural environment.
11.02	Identify sustainable alternatives to conventional practices.
11.03	Identify specific practices that can lessen adverse impacts on the environment.
12.0	Identify components of network systems related to the Architecture and Construction industry--The student will be able to:
12.01	Identify structure to access internet, including hardware and software components.
12.02	Identify and configure user customization features in web browsers, including preferences, caching, and cookies.
12.03	Recognize essential database concepts.
12.04	Define and use additional networking and internet services.
13.0	Describe and use communication features of information technology--The student will be able to:
13.01	Define important internet communications protocols and their roles in delivering basic Internet services.

CTE Standards and Benchmarks
13.02 Identify basic principles of the Domain Name System (DNS).
13.03 Identify security issues related to Internet clients.
13.04 Identify and use principles of Personal Information Management (PIM), including common applications.
13.05 Efficiently transmit text and binary files using popular Internet services.
13.06 Conduct a webcast and related services.
13.07 Represent technical issues to a non-technical audience.

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.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular career and technical student organization 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 as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. 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 IEP served in Exceptional Student Education (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 and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Course Title: **Architecture and Construction Directed Study**
Career Cluster: **Architecture and Construction**

Secondary – Career Preparatory	
Course Number	8700100
CIP Number	0647999901
Grade Level	11-12
Course Length	Multiple credits
Teacher Certification	Refer to the **Course Structure** section.
CTSO	SkillsUSA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this course is to provide students with learning opportunities in a prescribed program of study within the Architecture and Construction cluster that will enhance opportunities for employment in the career field chosen by the student.

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

Course Structure

The content is prescribed by the instructor based upon the individual student's assessed needs for directed study.

This course may be taken only by a student who has completed or is currently completing a specific secondary job preparatory program for additional study in this career cluster. A student may earn multiple credits in this course.

The selected standards and benchmarks, which the student must master to earn credit, must be outlined in an instructional plan developed by the instructor.

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

The following table illustrates the secondary course structure:

Course Number	Course Title	Teacher Certification	Length	Level	Graduation Requirement
8700100	Architecture and Construction Directed Study	Any Certification appropriate to the students' chosen career field	1 credit – Multiple credits	2	CT

(Graduation Requirement Codes: CT= Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA= Mathematics, PL= Personal Financial Literacy)

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Demonstrate expertise in a specific occupation contained within the career cluster.
02.0 Conduct investigative research on a selected topic related to the career cluster using approved research methodology, interpret findings, and prepare presentation to defend results.
03.0 Apply enhanced leadership and professional career skills.
04.0 Demonstrate higher order critical thinking and reasoning skills appropriate for the selected program of study.

Florida Department of Education
Student Performance Standards

Course Title: **Architecture and Construction Directed Study**
Course Number: **8700100**
Course Credit: **1 credit**

CTE Standards and Benchmarks	
01.0	Demonstrate expertise in a specific occupation within the career cluster. The student will be able to:
01.01	The benchmarks will be selected from the appropriate curriculum frameworks and determined by the instructor based upon the individual students assessed needs.
02.0	Conduct investigative research on a selected topic related to the career cluster using approved research methodology, interpret findings, and prepare presentation to defend results. The student will be able to:
02.01	Select investigative study referencing prior research and knowledge.
02.02	Collect, organize and analyze data accurately and precisely.
02.03	Design procedures to test the research.
02.04	Report, display and defend the results of investigations to audiences that may include professionals and technical experts.
03.0	Apply enhanced leadership and professional career skills. The student will be able to:
03.01	Develop and present a professional presentation offering potential solutions to a current issue.
03.02	Enhance leadership and career skills through work-based learning including job placement, job shadowing, entrepreneurship, internship, or a virtual experience.
03.03	Participate in leadership development opportunities available through the appropriate student organization and/or other professional organizations.
03.04	Enhance written and oral communications through the development of presentations, public speaking, and live and/or virtual interviews.
04.0	Demonstrate higher order critical thinking and reasoning skills appropriate for the selected program of study. The student will be able to:
04.01	Use mathematical and/or scientific skills to solve problems encountered in the chosen occupation.
04.02	Read and interpret information relative to the chosen occupation.
04.03	Locate and evaluate key elements of oral and written information.
04.04	Analyze and apply data and/or measurements to solve problems and interpret documents.
04.05	Construct charts/tables/graphs using functions and data.

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 co-curricular career and technical student organization 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 as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. 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 IEP served in Exceptional Student Education (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 and regulated secondary programs 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 course or a modified course. 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 a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. 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.

Florida Department of Education
Curriculum Framework

Course Title: **Architecture and Construction Cooperative Education OJT**
Course Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

Secondary – Cooperative Education - OJT	
Course Number	8700400
CIP Number	06469999CP
Grade Level	9-12
Course Length	Multiple credits
Teacher Certification	Refer to the **Course Structure** section.
CTSO	SkillsUSA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This course 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 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 cluster.

Each student job placement must be related to the job preparatory program in which the student is enrolled or has completed.

The purpose of this course is to provide the on-the-job training component when the **cooperative method of instruction** is appropriate. Whenever the cooperative method is offered, the following is required for each student: a training agreement; a training plan signed by the student, teacher and employer, including instructional objectives; a list of on-the-job and in-school learning experiences; a workstation which reflects equipment, skills and tasks which are relevant to the occupation which the student has chosen as a career goal; and a site supervisor with a working knowledge of the selected occupation. The workstation may be in an industry setting or in a virtual learning environment. The student **must be compensated** for work performed.

The teacher/coordinator must meet with the site supervisor a minimum of once during each grading period for the purpose of evaluating the student's progress in attaining the competencies listed in the training plan.

Architecture and Construction Cooperative Education OJT may be taken by a student for one or more semesters. A student may earn multiple credits in this course. The specific student performance standards which the student must achieve to earn credit are specified in the Cooperative Education - OJT Training Plan.

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

Course Structure

The following table illustrates the secondary course structure:

Course Number	Course Title	Teacher Certification	Length	Level	Graduation Requirement
8700400	Architecture and Construction Cooperative Education OJT	Any Certification appropriate to the students' chosen career field	Multiple Credits	2	CT

(Graduation Requirement Codes: CT= Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA= Mathematics, PL= Personal Financial Literacy)

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Perform designated job skills.
02.0 Demonstrate work ethics.

Florida Department of Education
Student Performance Standards

Course Title: **Architecture and Construction Cooperative Education OJT**
Secondary Number: **8700400**

Standards and Benchmarks	
01.0	Perform designated job skills. The student will be able to:
01.01	Perform tasks as outlined in the training plan.
01.02	Demonstrate job performance skills.
01.03	Demonstrate safety procedures on the job.
01.04	Maintain appropriate records.
01.05	Attain an acceptable level of productivity.
01.06	Demonstrate appropriate dress and grooming habits.
02.0	Demonstrate work ethics. The student will be able to:
02.01	Follow directions.
02.02	Demonstrate good human relations skills on the job.
02.03	Demonstrate good work habits.
02.04	Demonstrate acceptable business ethics.

Additional Information

Special Notes

The **Cooperative Education Manual** is available on-line and has guidelines for students, teachers, employers, parents and other administrators and sample training agreements. It can be accessed on the DOE Website at: http://fldoe.org/academics/career-adult-edu/career-tech-edu/additional-cte-programs-courses/diversified-edu.stml.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular career and technical student organization(s) 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 as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

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 course or a modified course. 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 a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. 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.

Florida Department of Education
Curriculum Framework

Program Title: **Building Construction Technologies**
Program Type: **Career Preparatory**
Career Cluster: **Architecture & Construction**

Secondary – Career Preparatory	
Program Number	8720300
CIP Number	0646041504
Grade Level	9-12
Program Length	7 Credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9071 -- Maintenance and Repair Workers
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 or advanced training in the building construction industry.

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 & 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 & Construction career cluster.

The content includes but is not limited to developing skills in various construction trades, as well as providing a foundation in construction management.

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 totaling seven credits.

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

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8720310	Building Construction Technologies 1	AC HEAT ME @7 7G BLDG CONST @7 7G BLDG MAINT @7 7G CARPENTRY @7 7G DRAFTING @7 7G ELECTRICAL @7 7G ENG 7G PLUMBIN @7 7G SHEETMETAL @7 7G TEC CONSTR @7 7G TEC DRAFT 7G TROWEL TR 7G	1 Credit	49-9071	2	CT
8720320	Building Construction Technologies 2		1 Credit		2	CT
8720330	Building Construction Technologies 3		1 Credit		3	CT
8720340	Building Construction Technologies 4		1 Credit		2	CT
8720350	Building Construction Technologies 5		1 Credit		2	CT
8720360	Building Construction Technologies 6		1 Credit		2	CT
8720370	Building Construction Technologies 7		1 Credit		2	CT

(Graduation Requirement Codes: CT= Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA= Mathematics, PL= Personal Financial Literacy)

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
02.0 Investigate the construction industry and explore related occupations.
03.0 Select and use basic hand tools.
04.0 Select and use power tools and describe their proper operation.
05.0 Demonstrate mathematics knowledge and skills relevant to the construction industry.
06.0 Read and interpret construction drawings.
07.0 Frame floor systems based on drawing and specification requirements.
08.0 Frame walls and ceilings based on drawing and specification requirements.
09.0 Frame a roof based on drawing and specification requirements.
10.0 Analyze construction components, materials, hardware and characteristics.
11.0 Demonstrate masonry skills.
12.0 Erect, plumb and brace a simple concrete form with reinforcement.
13.0 Place concrete.
14.0 Demonstrate welding knowledge and skills (optional).
15.0 Understand construction documents, contract documents and specifications.
16.0 Select the appropriate heavy equipment for a given task. (optional)
17.0 Identify local, state and federal codes and regulations.
18.0 Perform site preparation and maintenance.
19.0 Estimate project costs and schedule construction activities for a specific job.
20.0 Investigate sustainability issues related to the design, construction and maintenance of the built environment.
21.0 Complete a construction project using skills learned in the program.
22.0 Install roofing materials.
23.0 Install exterior finishes.
24.0 Explain the importance of employability and entrepreneurship skills.
25.0 Demonstrate interior carpentry skill.
26.0 Install cabinets.
27.0 Prepare and apply finishes to surfaces.
28.0 Build stairs.
29.0 Troubleshoot, repair and install plumbing systems.
30.0 Demonstrate knowledge of Drain, Waste and Vent (DWV) systems.
31.0 Measure, cut and join plastic piping.
32.0 Properly measure, ream, cut and join copper piping.
33.0 Demonstrate electrical safety.
34.0 Troubleshoot, repair and install electrical systems.
35.0 Research the Heating, Ventilation and Air-Conditioning (HVAC) profession.
36.0 Maintain, repair and install HVAC systems.

Florida Department of Education
Student Performance Standards

Course Title: **Building Construction Technologies 1**
Course Number: **8720310**
Course Credit: **1**

Course Description:

The purpose of this course is to develop the competencies essential to the building construction industry. These competencies include skills and knowledge related to safety practices, the proper use of hand and power tools, plan reading, basic rough carpentry and framing.

CTE Standards and Benchmarks	
01.0	Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
01.01	Understand the role and the purpose of the Occupational Safety and Health Administration (OSHA) rules and regulations.
01.02	Identify and locate Safety Data Sheets (formerly called Material Safety Data Sheets (MSDS)) and follow the procedures as necessary.
01.03	While using a safety data sheet, identify health-related problems that may result from exposure to work-related chemicals and hazardous materials, and demonstrate knowledge of the proper precautions required for handling such materials.
01.04	Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200)
01.05	Identify and use safety equipment and personal protective equipment (PPE).
01.06	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.07	Explain emergency procedures to follow in response to workplace accidents.
02.0	Investigate the construction industry and explore related occupations. The student will be able to:
02.01	Demonstrate an understanding of the relationship between construction and the environment.
02.02	Describe the role of trade unions in the construction industry.
02.03	Research apprenticeship opportunities.
02.04	Identify the different classifications of construction projects.
02.05	Define the roles and responsibilities of the general contractor, specialty contractor, construction management and design build firms.
02.06	Research construction trade occupations and the roles and responsibilities of each craft.

CTE Standards and Benchmarks	
	02.07 Research construction management occupations and the roles and responsibilities of each.
	02.08 Identify design and engineering occupations and the roles and responsibilities of each.
	02.09 Describe the process of applying for building permits and variances.
	02.10 Explain the importance of zoning requirements.
03.0	Select and use basic hand tools. The student will be able to:
	03.01 Identify, select and use appropriate hammers used in the construction industry.
	03.02 Identify, use and select saws to cut material.
	03.03 Identify and use various common screwdriver types.
	03.04 Select and use various types of non-adjustable wrenches, adjustable wrenches and plumbing tools, chisels and punches, pliers, ripping bars and nail pullers, woodworking files, spirit levels, socket wrench sets, hand or block sanders, carpenters' squares, utility knives, clamps and shovels.
04.0	Select and use power tools and describe their proper operation. The student will be able to:
	04.01 Identify power tools including sanders, drills, circular saws, jig saws, reciprocating saws, table saws, band saws (optional), miter saws, drill presses (optional), grinders, electric routers and pneumatic nailers.
	04.02 Identify and use various types of drill bits.
	04.03 Describe the proper operation of power tools and equipment.
05.0	Demonstrate mathematics knowledge and skills relevant to the construction industry. The student will be able to:
	05.01 Solve job-related problems by adding, subtracting, multiplying and dividing numbers, using fractions, decimals and whole numbers.
	05.02 Change numbers to percentages.
	05.03 Demonstrate knowledge of arithmetic operations.
	05.04 Read a ruler and a tape measure.
	05.05 Compute feet, inches and yards.
	05.06 Change hours and minutes to decimals (optional), fractions and mixed numbers.
	05.07 Analyze and apply data and measurements to solve problems and interpret documents.

CTE Standards and Benchmarks	
	05.08 Determine ratios and proportions.
	05.09 Convert decimals to fractions and fractions to decimals.
	05.10 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares and cylinders.
06.0	Read and interpret construction drawings. The student will be able to:
	06.01 Identify basic construction drawing terms, components and symbols, and where to locate these on the drawings.
	06.02 Locate sections, elevations and details to their location on the plan view.
	06.03 Use drawing dimensions to lay out a construction project.
	06.04 Interpret and use architectural scales.
07.0	Frame floor systems based on drawing and specification requirements. The student will be able to:
	07.01 Identify floor and sill framing and support members.
	07.02 Name the methods used to fasten sills to the foundation.
	07.03 Understand how girder/beam and joist sizes are selected.
	07.04 Identify different types of floor joists.
	07.05 Identify different types of bridging.
	07.06 Identify different types of flooring materials.
	07.07 Explain the purposes of subflooring and underlayment.
	07.08 Match selected fasteners used in floor framing to their correct uses.
	07.09 Estimate the amount of material needed to frame a floor assembly.
	07.10 Demonstrate the ability to:
	• Lay out and construct a floor assembly.
	• Install bridging (wood cross bridging, solid wood bridging and steel cross bridging).
	• Install joists for a cantilever floor.

CTE Standards and Benchmarks	
	• Install a subfloor using butt-joint plywood/OSB panels and structural panels.
	• Install a single floor system using tongue-and-groove plywood/OSB panels.
08.0	Frame walls and ceilings based on drawing and specification requirements. The student will be able to:
08.01	Identify the components of a wall and ceiling layout.
08.02	Lay out a wood frame wall, including plates, corner posts, door and window openings, partition T's, bracing and the use of fire stops where applicable.
08.03	Identify the common materials and methods used for installing sheathing on walls.
08.04	Demonstrate the ability to dry in a structure (i.e., Building wrap, paper, taping, etc.).
08.05	Lay out, assemble, erect and brace exterior walls for a frame building.
08.06	Describe wall framing techniques used in masonry construction.
08.07	Explain or demonstrate the use of metal studs in wall framing.
08.08	Layout, cut and install ceiling joists on a wood frame building.
08.09	Estimate the materials required to frame walls and ceilings.
09.0	Frame a roof based on drawing and specification requirements. The student will be able to:
09.01	Define the terms associated with roof framing.
09.02	Identify the roof framing members used in gable and hip roofs.
09.03	Calculate the length of a rafter using various methods.
09.04	Identify the various types of trusses used in roof framing.
09.05	Use a rafter framing square, speed square and calculator in laying out a roof.
09.06	Identify various types of sheathing used in roof construction.
09.07	Frame a gable roof with vent openings.
09.08	Frame a roof opening.
09.09	Erect a gable roof using trusses.

CTE Standards and Benchmarks
09.10 Estimate the materials used in framing and sheathing a roof.

Florida Department of Education
Student Performance Standards

Course Title: **Building Construction Technologies 2**
Course Number: **8720320**
Course Credit: **1**

Course Description:

The purpose of this course is to develop the competencies necessary for the building, construction and repair industry. These competencies relate to construction components, materials and hardware, concrete and masonry skills.

CTE Standards and Benchmarks	
10.0	Analyze construction components, materials, hardware and characteristics. The student will be able to:
10.01	Identify the components of various kinds of structures including slabs and foundations, interior and exterior walls, roofs and flooring systems.
10.02	Identify the types of wall sections.
10.03	Identify the types and installation procedures of roof, wall and floor sheathing.
10.04	Identify various roof supports.
11.0	Demonstrate masonry skills. The student will be able to:
11.01	Describe the most common types of masonry units.
11.02	Describe how to set up and plumb a wall.
11.03	Describe the transformation pattern (i.e., Different brick pattern, floor tile, plywood on floor, vinyl siding, etc.)
11.04	Lay a dry bond.
11.05	Spread and furrow a bed joint and butter masonry units.
11.06	Describe the different types of masonry bonds.
11.07	Cut brick and block accurately.
11.08	Select the tools and equipment used for mixing mortar.
11.09	Describe the factors that affect the consistency of mortar.

CTE Standards and Benchmarks	
	11.10 Identify the common ratios (M, N, S and O) of mortar mixtures.
	11.11 Use pointing tools and strike mortar joints.
	11.12 Repoint old work.
	11.13 Prepare a work area, protecting adjacent areas.
	11.14 Use various methods of putting up the line.
	11.15 Identify and use the uses for various types of trowels.
	11.16 Identify and use the various types of caulking and application.
	11.17 Demonstrate the procedures for stucco application and repair.
	11.18 Mix various types of stucco.
	11.19 Identify, select, use and maintain tools, materials and equipment used in masonry.
	11.20 Use safe and proper procedures for cleaning equipment, materials, work areas and worker.
12.0	Erect, plumb and brace a simple concrete form with reinforcement. The student will be able to:
	12.01 Identify the properties of cement.
	12.02 Understand the various types of concrete, considering application and Pounds per Square Inch (PSI) strength.
	12.03 Describe the composition of concrete.
	12.04 Perform volume estimates for concrete quantity requirements.
	12.05 Identify types of concrete reinforcement materials and describe their uses.
	12.06 Identify various types of footings and explain their uses.
	12.07 Identify the parts of various types of forms.
	12.08 Construct various types of concrete forms.
	12.09 Describe in-beds used in concrete formwork.
	12.10 Identify appropriate form stripping and handling techniques.

CTE Standards and Benchmarks	
	12.11 Explain the safety procedures associated with the construction and use of concrete forms.
13.0	Place concrete. The student will be able to:
	13.01 Describe how to slump test concrete before placement.
	13.02 Identify equipment used to transport and place concrete.
	13.03 Identify, select and use concrete tools.
	13.04 Place and consolidate concrete into forms.
	13.05 Strike off and level concrete using a screed.
	13.06 Use tools to place, float and finish concrete.
	13.07 Determine when conditions permit the concrete finishing operation to start.
	13.08 Name the factors that affect the curing of concrete and describe the methods used to achieve proper curing.
14.0	Demonstrate welding knowledge and skills. (optional) The student will be able to:
	14.01 Identify welding and cutting hazards and how to avoid or minimize them in the workplace.
	14.02 Identify and demonstrate the proper use of cutting and welding equipment [e.g., Oxy-Fuel, Plasma Arc, Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW), Gas Tungsten Arc Welding (GTAW)].

Florida Department of Education
Student Performance Standards

Course Title: **Building Construction Technologies 3**
Course Number: **8720330**
Course Credit: **1**

Course Description:

This course is designed to provide students with a more in-depth knowledge of construction documents, as well as competencies in construction management. These include heavy equipment selection, knowledge of codes and regulations, site preparation, estimating, scheduling and knowledge of sustainability issues relevant to the construction industry.

CTE Standards and Benchmarks	
15.0	Understand construction documents, contract documents and specifications. The student will be able to:
15.01	Explain the purpose and components of contract documents and specifications.
15.02	Read, interpret and apply plans, elevations, sections and details.
15.03	Explain the relationships of the elements of contract documents.
15.04	Create lists of materials and prepare estimates.
15.05	Use architectural and engineering scales.
15.06	Compare various Computer-Aided Drafting (CAD) and Building Information Modeling (BIM) products and how they can be used by designers and construction project managers. (optional)
15.07	Compare and analyze traditional drafting with CAD and BIM systems. (optional)
15.08	Identify and use technology and other resources to assist with design decisions.
16.0	Select the appropriate heavy equipment for a given task. (optional) The student will be able to:
16.01	Identify different types and uses of heavy equipment.
16.02	Describe the operations of different types of heavy equipment.
17.0	Identify local, state and federal codes and regulations. The student will be able to:
17.01	Identify and locate local, state and federal codes, regulations and standards.
17.02	Identify local, state and federal regulatory agencies.

CTE Standards and Benchmarks	
18.0	Perform site preparation and maintenance. The student will be able to:
18.01	Understand zoning requirements.
18.02	Understand property lines and building setbacks.
18.03	Understand grades and elevations.
18.04	Understand the need to add, remove or relocate fill to proper compaction.
18.05	Lay out and mark building locations and elevations.
18.06	Clean and maintain the site.
19.0	Estimate project costs and schedule construction activities for a specific job. The student will be able to:
19.01	Calculate material quantities and purchase cost (including sales tax).
19.02	Calculate labor costs including work hours, duration and cost of workers.
19.03	Explain and compute federal, state and local taxes.
19.04	Schedule various construction activities (i.e., timeframes, workers & special equipment).
20.0	Investigate sustainability issues related to the design, construction and maintenance of the built environment. The student will be able to:
20.01	Describe the impact of the construction industry on the natural environment.
20.02	Recommend sustainable alternatives to conventional construction practices.
20.03	Identify specific practices that can lessen adverse impacts on the environment.
20.04	Understand holistic green and LEED (Leadership in Energy and Environmental Design) construction.
21.0	Complete a construction project using skills learned in the program. The student will be able to:
21.01	Create a 3-dimensional representational or abstract model.
21.02	Demonstrate imaginative or innovative solutions for a design project.
21.03	Develop competence and dexterity through practice in the use of processes, tools and techniques.
21.04	Apply critical-thinking and problem solving skills used in design and construction to develop solutions for real-life issues.

CTE Standards and Benchmarks
21.05 Use and maintain tools and equipment to facilitate the design and construction process.
21.06 Work in a project team to show cohesiveness, team building, respectful compromise and time-management skills.

Florida Department of Education
Student Performance Standards

Course Title: **Building Construction Technologies 4**
Course Number: **8720340**
Course Credit: **1**

Course Description:

The purpose of this course is to develop competencies in exterior finish carpentry.

CTE Standards and Benchmarks	
22.0	Install roofing materials. The student will be able to:
22.01	Identify and explain different types of roofing systems and applications.
22.02	Install various types of shingles.
22.03	Install roof gutters and downspouts.
22.04	Seal pipes and vents on roofs.
22.05	Identify installation procedures for sheet metal roofs, built-up roofs and roof flashing.
23.0	Install exterior finishes. The student will be able to:
23.01	Describe the purpose of wall insulation and flashing.
23.02	Install common cornices.
23.03	Estimate lap and panel siding.
23.04	Describe the types and applications of various types of siding (e.g., wood, fiber-cement, vinyl, metal, stucco, masonry, etc.).
23.05	Install siding.
24.0	Explain the importance of employability and entrepreneurship skills. The student will be able to:
24.01	Identify and demonstrate positive work behaviors needed to be employable.
24.02	Develop personal career plan that includes goals, objectives and strategies.
24.03	Examine licensing, certification and industry credentialing requirements.

CTE Standards and Benchmarks
24.04 Maintain a career portfolio to document knowledge, skills and experience.
24.05 Evaluate and compare employment opportunities that match career goals.
24.06 Identify and exhibit traits for retaining employment.
24.07 Identify opportunities and research requirements for career advancement.
24.08 Research the benefits of ongoing professional development.
24.09 Examine and describe entrepreneurship opportunities as a career planning option.

Florida Department of Education
Student Performance Standards

Course Title: **Building Construction Technologies 5**
Course Number: **8720350**
Course Credit: **1**

Course Description:

The purpose of this course is to develop knowledge and skills in interior finish carpentry.

CTE Standards and Benchmarks	
25.0	Demonstrate interior carpentry skills. The student will be able to:
25.01	Install interior finish materials (i.e., wood trim, drywall, floor/wall tile, acoustic tile, etc.).
25.02	Install and trim exterior and interior doors and windows.
26.0	Install cabinets. The student will be able to:
26.01	Identify the parts of a cabinet.
26.02	Identify the types of cabinet door installation.
26.03	Identify the types of cabinet hardware.
26.04	Install cabinets and hardware.
27.0	Prepare and apply finishes to surfaces. The student will be able to:
27.01	Erect an extension ladder and a scaffold.
27.02	Prepare surfaces for finishes.
27.03	Apply finished coatings to surfaces with a roller, brush and sprayer.
28.0	Build stairs. The student will be able to:
28.01	Identify various types and parts of stairs.
28.02	Identify materials used in the construction of stairs.
28.03	Interpret construction drawings of stairs.

CTE Standards and Benchmarks
28.04 Calculate the total rise, the number and size of the risers and treads required for a stairway.
28.05 Lay out and cut stringers, risers and treads.

Florida Department of Education
Student Performance Standards

Course Title: **Building Construction Technologies 6**
Course Number: **8720360**
Course Credit: **1**

Course Description:

The purpose of this course is to develop knowledge and skills in plumbing.

CTE Standards and Benchmarks	
29.0	Troubleshoot, repair and install plumbing systems. The student will be able to:
	29.01 Troubleshoot, repair and install bathroom fixtures and hardware such as lavatories, water closets, urinals, showers, bathtubs, traps and drain, waste and vent (DWV) systems.
	29.02 Troubleshoot, repair and install kitchen fixtures and hardware, such as sinks, garbage disposals, faucets and hot water heaters.
	29.03 Identify and install various pipes and tubing used in the plumbing trade.
	29.04 Test and inspect plumbing systems.
30.0	Demonstrate knowledge of Drain, Waste and Vent (DWV) systems. The student will be able to:
	30.01 Explain how waste moves from a fixture through the drain system to the environment.
	30.02 Identify the major components of a drainage system and describe their functions.
	30.03 Identify the different types of traps and their components.
	30.04 Explain the importance of traps and identify the ways that traps can lose their seals.
	30.05 Identify the various types of DWV fittings and describe their applications.
	30.06 Identify significant code and health issues, violations and consequences related to DWV systems.
31.0	Measure, cut and join plastic piping. The student will be able to:
	31.01 Identify the types of materials and schedules of plastic piping.
	31.02 Identify proper and improper applications of plastic piping.
	31.03 Identify the types of fittings and valves used with plastic piping.

CTE Standards and Benchmarks	
	31.04 Identify and determine the kinds of hangers and supports needed for plastic piping.
	31.05 Identify the various techniques used in hanging and supporting plastic piping.
	31.06 Explain proper procedures for the handling, storage and protection of plastic pipes.
32.0	Properly measure, ream, cut and join copper piping. The student will be able to:
	32.01 Identify the types of materials and schedules used with copper piping.
	32.02 Identify the material properties, storage and handling requirements of copper piping.
	32.03 Identify the types of fittings and valves used with copper piping.
	32.04 Identify and demonstrate the techniques used in hanging and supporting copper piping.
	32.05 Identify the hazards and safety precautions associated with copper piping.

Florida Department of Education
Student Performance Standards

Course Title: **Building Construction Technologies 7**
Course Number: **8720370**
Course Credit: **1**

Course Description:

This course is designed to provide students with knowledge and skills for the installation, repair and replacement of electrical and heating, ventilation and air-conditioning (HVAC) systems.

CTE Standards and Benchmarks	
33.0	Demonstrate electrical safety. The student will be able to:
33.01	Identify electrical hazards and how to avoid or minimize them in the workplace.
33.02	Explain safety issues concerning lockout/tag-out procedures, confined space entry, respiratory protection and fall protection systems.
33.03	Develop a task plan and hazard assessment for a given task and select the appropriate Personal Protective Equipment (PPE) and work methods.
33.04	Explain the Role of the National Electric Code.
34.0	Troubleshoot, repair and install electrical systems. The student will be able to:
34.01	Explain basic electrical theory.
34.02	Explain branch circuit systems.
34.03	Calculate and select service-entrance equipment.
34.04	Identify and explain Ground Fault Circuit Interrupter (GFCI) circuitry.
34.05	Troubleshoot electrical systems, using testing and metering devices.
34.06	Install electrical outlets, switches and light fixtures.
34.07	Install and replace breakers (and fuses, if applicable).
34.08	Identify types of wiring raceways.
34.09	Test and inspect electrical systems.

CTE Standards and Benchmarks	
	34.10 Identify alternative energy sources (i.e., solar, wind, mechanical, thermal, etc.).
35.0	Research the Heating, Ventilation and Air-Conditioning (HVAC) profession. The student will be able to:
	35.01 Explain what the Clean Air Act means to the HVAC profession.
	35.02 Describe regulatory codes relevant to the HVAC industry.
36.0	Maintain, repair and install HVAC systems. The student will be able to:
	36.01 Explain heating and cooling principles and code requirements.
	36.02 Describe various methods of calculating heating and cooling loads.
	36.03 Explain the operation and types of the following heating methods: water, steam, forced air, gas, electrical components, heat pumps and associated electrical components.
	36.04 Identify refrigerants.
	36.05 Identify and replace air filters and maintain drain systems.
	36.06 Explain how to troubleshoot, repair and replace control systems.

Additional Information

Laboratory Activities

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

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. 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 IEP served in Exceptional Student Education (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 and regulated secondary programs 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 course or a modified course. 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 a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. 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.

Florida Department of Education
Curriculum Framework

Program Title: **Painting and Decorating**
Program Type: **Career Preparatory**
Career Cluster: **Architecture & Construction**

Secondary – Career Preparatory	
Program Number	8721500
CIP Number	0646040800
Grade Level	9-12
Program Length	4 Credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-2141 -- Painters, Construction and Maintenance
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 painters.

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 safe and efficient work practices, materials and cost estimates, surface preparation, paint mixing and matching, application procedures, special effects, wall covering application, blueprint reading, ladder and scaffold erection and use, selection, application and care of materials, use of hand and power tools, and use of current industry standards, practices and techniques.

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 totaling four credits.

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

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8721510	Painting 1	TEC CONSTR ¶ 7 ¶ G BLDG CONST ¶ 7 ¶ G PAINTING 7G	1 Credit	47-2141	2	CT
8721520	Painting 2		1 Credit		2	CT
8721530	Painting and Decorating 3		1 Credit		2	CT
8721540	Painting and Decorating 4		1 Credit		2	CT

(Graduation Requirement Codes: CT= Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA= Mathematics, PL= Personal Financial Literacy)

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Work safely.
02.0 Select, use and care for tools, equipment, scaffolding and ladders.
03.0 Prepare surfaces.
04.0 Select materials and products for a painting/ decorating project.
05.0 Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
06.0 Use chemical stripping and cleaning solutions.
07.0 Estimate cost and provide quotations.
08.0 Demonstrate mathematics knowledge and skills.
09.0 Demonstrate proper application of materials used in painting using brushes, rollers and sprayers.
10.0 Mix colors and match samples.
11.0 Demonstrate science knowledge and skills.
12.0 Apply stains, varnishes, lacquers and acrylics.
13.0 Advise on suitability of different materials.
14.0 Fit and apply wallpaper.
15.0 Explain the importance of employability and entrepreneurship skills.

Florida Department of Education
Student Performance Standards

Course Title: **Painting 1**
Course Number: **8721510**
Course Credit: **1**

Course Description:

This course focuses on safety, surface preparation, estimating and selection of appropriate tools and materials.

CTE Standards and Benchmarks	
01.0	Work safely. The student will be able to:
01.01	Explain the hazards of working above ground and appropriate work habits.
01.02	Explain and demonstrate safe use of hand and power tools.
01.03	Review, discuss, and demonstrate the proper applications and safety procedures for hazardous chemicals and equipment.
02.0	Select, use and care for tools and equipment, scaffolding and ladders. The student will be able to:
02.01	Erect a scaffold.
02.02	Demonstrate proper use of folding and extension ladders.
02.03	Explain proper storage of flammable materials.
02.04	Explain and demonstrate proper cleaning and storage of tools and equipment.
03.0	Prepare surfaces. The student will be able to:
03.01	Prepare new wood surfaces for coating with paint.
03.02	Remove old wall and ceiling coverings including ceiling popcorn.
03.03	Prepare and seal walls for wall coverings and ceilings for decorative coatings.
03.04	Prime plaster and sheetrock surfaces for painting.
03.05	Prepare metal surfaces for painting.
03.06	Use sandblasting equipment to remove old surface coatings.

CTE Standards and Benchmarks	
	03.07 Spackle/patch sheetrock and plaster surfaces.
	03.08 Prepare masonry surfaces for coatings.
	03.09 Review, discuss, and demonstrate the proper applications and safety procedures for hazardous chemicals and equipment.
04.0	Select materials and products for a painting/ decorating project. The student will be able to:
	04.01 Explain the criteria for selection and use of water and chemical based coatings.
	04.02 Select brushes, roller covers and spray equipment for coatings to be used.
	04.03 Apply various finishes to drywall including faux finishes, textures and popcorn.
	04.04 Use and maintain tools and equipment to facilitate the creative process.
	04.05 Assess the challenges and outcomes associated with the media used in a variety of one's own works.
05.0	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:
	05.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
	05.02 Explain emergency procedures to follow in response to workplace accidents.
	05.03 Create a disaster and/or emergency response plan.
	05.04 Demonstrate knowledge of the "Right-To-Know Law" as recorded in (29 CFR-1910.1200).
06.0	Use chemical stripping and cleaning solutions. The student will be able to:
	06.01 Remove a finish or coating from a surface using a chemical solution.
	06.02 Use prepared solutions to clean a surface.
	06.03 Apply rust inhibitors to metal surfaces.
	06.04 Apply the critical-thinking and problem-solving skills to develop creative solutions for projects.
07.0	Estimate cost and provide quotations. The student will be able to:
	07.01 Compute number of rolls of wallpaper required for a specified job.
	07.02 Compute amount of paint for a specified job.

CTE Standards and Benchmarks	
	07.03 Work in a team to develop and revise job estimates for clients while showing artistic cohesiveness, team-building, respectful compromise, and time-management skills.
08.0	Demonstrate mathematics knowledge and skills. The students will be able to:
	08.01 Demonstrate knowledge of arithmetic operations.
	08.02 Analyze and apply data and measurements to solve problems and interpret documents.
	08.03 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares and cylinders.
	08.04 Measure tolerance(s) on horizontal and vertical surfaces using feet and inches.
	08.05 Add, subtract, multiply and divide using fractions, decimals and whole numbers.
	08.06 Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
	08.07 Demonstrate an understanding of federal, state and local taxes and their computation.
	08.08 Investigate the use of space, scale, and environmental features of a structure to create three-dimensional form or the illusion of depth and form.
	08.09 Analyze challenges and identify solutions for three-dimensional structural problems.

Florida Department of Education
Student Performance Standards

Course Title: **Painting 2**
Course Number: **8721520**
Course Credit: **1**

Course Description:

This course has a strong emphasis on color and light theory. Students learn the science of mixing paint colors and how to paint using brushes, sprayers and rollers.

CTE Standards and Benchmarks	
09.0	Demonstrate proper application of materials used in painting using brushes, rollers and sprayers. The student will be able to:
09.01	Paint a surface using a brush.
09.02	Paint trim with a brush.
09.03	Paint a surface with a roller.
09.04	Spray paint a surface.
10.0	Mix colors and match samples. The student will be able to:
10.01	Identify fundamental colors.
10.02	Explain the process of mixing to arrive at custom colors or tints.
10.03	Mix paint to match a given sample.
10.04	Develop color-mixing skills and techniques through application of the principles of heat properties and color and light theory.
10.05	Use critical-thinking skills for various contexts to develop, refine, and reflect on a theme.
11.0	Demonstrate science knowledge and skills. The student will be able to:
11.01	Understand molecular action as a result of temperature extremes, chemical reaction and moisture content.
11.02	Discuss the role of creativity in constructing scientific questions, methods and explanations.
11.03	Demonstrate visual-thinking skills to process the challenges and execution of a creative endeavor.

CTE Standards and Benchmarks	
11.04	Incorporate skills, concepts, and media to create images from ideation to resolution.
11.05	Formulate scientifically investigable questions, construct investigations, collect and evaluate data, and develop scientific recommendations based on findings.
11.06	Identify health-related problems, which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
11.07	Understand pressure measurement in terms of PSI and KPA.

Florida Department of Education
Student Performance Standards

Course Title: **Painting and Decorating 3**
Course Number: **8721530**
Course Credit: **1**

Course Description:

This course focuses on determining the suitability for various finish materials as well as the application of stains, varnishes, lacquers and acrylics.

CTE Standards and Benchmarks	
12.0	Apply stains, varnishes, lacquers and acrylics. The student will be able to:
12.01	Stain various surfaces and materials to a uniform color.
12.02	Stain various surfaces and materials to match a sample.
12.03	Seal various surfaces and materials for finishing
12.04	Apply a varnish finish to a prepared surface.
12.05	Apply an oil finish to a prepared surface.
12.06	Apply a lacquer finish to a prepared surface.
12.07	Apply an acrylic finish to a prepared surface.
13.0	Advise on suitability of different materials. The student will be able to:
13.01	Select a suitable type of wall covering based on surface of wall and environment.
13.02	Select a suitable type of coating based on surface, anticipated wear and environment.
13.03	Focus on visual information and processes to complete painting and decorating projects.
13.04	Use divergent thinking, abstract reasoning, and various processes to demonstrate imaginative or innovative solutions for painting and decorating projects.
13.05	Apply rules of convention to create purposeful design.

Florida Department of Education
Student Performance Standards

Course Title: **Painting and Decorating 4**
Course Number: **8721540**
Course Credit: **1**

Course Description:

This course provides instruction on applying wallpaper, as well as employability skills and entrepreneurship.

CTE Standards and Benchmarks	
14.0	Fit and apply wallpaper. The student will be able to:
14.01	Select and mix paste (for non-pre-pasted) wall coverings.
14.02	Apply grass cloth wall covering.
14.03	Apply paper wall covering.
14.04	Apply foil wall covering.
14.05	Apply Mylar wall covering.
14.06	Apply cloth-backed wall covering.
14.07	Match a pattern to a corner.
14.08	Fit wall paper around a window and door.
15.0	Explain the importance of employability and entrepreneurship skills. The students will be able to:
15.01	Identify and demonstrate positive work behaviors needed to be employable.
15.02	Develop personal career plan that includes goals, objectives and strategies.
15.03	Examine licensing, certification and industry credentialing requirements.
15.04	Maintain a career portfolio to document knowledge, skills and experience.
15.05	Evaluate and compare employment opportunities that match career goals.
15.06	Combine creative skills with entrepreneurialism to provide community service and leverage strengths in accomplishing a common objective.

CTE Standards and Benchmarks	
15.07	Examine career opportunities in the painting and decorating industry to determine requisite skills, qualifications, supply-and-demand, market location, and potential earnings.

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.

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English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. 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 IEP served in Exceptional Student Education (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 and regulated secondary programs 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 course or a modified course. 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 a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. 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.

Florida Department of Education
Curriculum Framework

Program Title: **Building Trades and Construction Design Technology**
Program Type: **Career Preparatory**
Career Cluster: **Architecture & Construction**

Secondary – Career Preparatory	
Program Number	8722000
CIP Number	0646041505
Grade Level	9-12
Program Length	6 Credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9071 -- Maintenance and Repair Workers, General
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 or advanced training in the building construction industry.

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 applying construction techniques; reading plans and specifications; and developing trade skills in carpentry, masonry, electricity, plumbing and air conditioning.

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 totaling six credits.

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

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8722010	Building Trades and Construction Design Technology 1	AC HEAT ME @7 7G BLDG CONST @7 7G BLDG MAINT @7 7G CARPENTRY @7 7G DRAFTING @7 7G ELECTRICAL @7 7G ENG 7G PLUMBIN @7 7G ROOFING 7G SHEETMETAL @7 7G TEC CONSTR @7 7G TEC DRAFT 7G TEC ED 1@2 ENG&TEC ED1@2 TROWEL TR 7G	1 Credit	49-9071	2	CT
8722020	Building Trades and Construction Design Technology 2		1 Credit		2	CT
8722030	Building Trades and Construction Design Technology 3		1 Credit		3	CT
8722040	Building Trades and Construction Design Technology 4		1 Credit		2	CT
8722050	Building Trades and Construction Design Technology 5		1 Credit		2	CT
8722060	Building Trades and Construction Design Technology 6		1 Credit		3	CT

(Graduation Requirement Codes: CT= Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA= Mathematics, PL= Personal Financial Literacy)

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Demonstrate safety practices and follow disaster plans.
02.0 Identify and use basic hand tools.
03.0 Identify power tools and describe their proper operation.
04.0 Discuss, identify, classify and present construction components, materials, hardware and characteristics.
05.0 Demonstrate an understanding of the construction industry and related occupations.
06.0 Explain the importance of employability and entrepreneurship skills.
07.0 Demonstrate or discuss rough and finish carpentry skills.
08.0 Demonstrate or discuss masonry skills.
09.0 Demonstrate or discuss painting and decorating skills.
10.0 Demonstrate or discuss science knowledge and skills.
11.0 Demonstrate mathematics knowledge and skills.
12.0 Explain all that the built environment encompasses.
13.0 Demonstrate an understanding of the natural environment, built environment and green built environment.
14.0 Research laws applicable to the construction industry.
15.0 Develop a basic understanding of construction contracts, drawings, documents and specifications and how they apply to the construction process.
16.0 Demonstrate or discuss electrical rough in skills.
17.0 Demonstrate or discuss finish electrical skills.
18.0 Demonstrate or discuss plumbing rough in skills.
19.0 Demonstrate or discuss finish plumbing skills.
20.0 Demonstrate or discuss Heating, Ventilation and Air Conditioning (HVAC) rough in skills.
21.0 Demonstrate finish HVAC skills.
22.0 Design a capstone project using skills learned throughout the program.

Florida Department of Education
Student Performance Standards

Course Title: **Building Trades and Construction Design Technology 1**
Course Number: **8722010**
Course Credit: **1**

Course Description:

The purpose of this course is to provide students with competencies in safety practices; the use of hand and power tools; construction components, materials and hardware; construction industry occupations and employability skills.

CTE Standards and Benchmarks	
01.0	Demonstrate safety practices and follow disaster plans. The student will be able to:
01.01	Observe and comply with all applicable company and organizational safety policies and Occupational Safety and Health Administration (OSHA) rules and regulations.
01.02	Be able to demonstrate the purpose of Safety Data Sheets (SDS), formerly known as Material Safety Data Sheets (MSDS), and follow the procedures as necessary.
01.03	Identify health-related problems that may result from exposure to work-related chemicals and hazardous materials, and demonstrate knowledge of the proper precautions required for handling such materials. (Refer to Safety Data Sheets.)
01.04	Discuss, analyze and discuss the “Right-to-Know” law, such as with chemical or health hazards, as recorded in (29 CFR-1910.1200).
01.05	Identify and demonstrate the use of safety equipment such as fall arrest systems, fire extinguishers, scaffolds and ladders.
01.06	Identify, interpret and follow disaster plans.
01.07	Describe and demonstrate appropriate safety attitudes and behaviors in the shop and on the job in the construction industry.
01.08	Describe and demonstrate the appropriate safe use and maintenance of portable and stationary power equipment in the shop and on the job in construction industry.
01.09	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.10	Explain and demonstrate emergency procedures to follow in response to workplace accidents.
01.11	Create a disaster and/or emergency response plan for a specific instance (earthquake, hurricane, tornado, etc.).
02.0	Identify and use basic hand tools. The student will be able to:
02.01	Select and utilize appropriate hand tools typically used in the construction industry for specific tasks in accordance with safety guidelines and standard practice.

CTE Standards and Benchmarks	
03.0	Identify power tools and describe their proper operation. The student will be able to:
03.01	Select and utilize appropriate power tools and equipment for specific tasks in accordance with safety guidelines.
04.0	Discuss, identify, classify and present construction components, materials, hardware and characteristics. The student will be able to:
04.01	Discuss, identify and present the various components, materials and hardware used in residential construction applications.
04.02	Discuss, identify and present the various components, materials and hardware used in commercial construction applications.
04.03	Discuss, identify and present the various components, materials and hardware used in industrial construction applications.
04.04	Discuss and present preplanning and procedural steps to accomplish various projects large and small both in the lab and on the job site with attention to building codes, standard practice and acceptable techniques.
05.0	Demonstrate an understanding of the construction industry and related occupations. The student will be able to:
05.01	Identify and distinguish construction trade occupations and the roles and responsibilities of each craft.
05.02	Identify and distinguish construction project management occupations and the roles and responsibilities of each.
05.03	Identify and differentiate design and engineering occupations and the roles and responsibilities of each.
05.04	Assess and discuss the relationship between the Department of Labor and the construction industry, economy and opportunity for employment.
06.0	Explain the importance of employability and entrepreneurship skills. The students will be able to:
06.01	Identify and demonstrate positive work behaviors needed to be employable.
06.02	Develop personal career plan that includes goals, objectives and strategies.
06.03	Examine and explain licensing, certification and industry credentialing requirements.
06.04	Maintain a career portfolio to document knowledge, skills and experience.
06.05	Evaluate and compare employment opportunities that match career goals.
06.06	Identify and exhibit traits for retaining employment.
06.07	Identify opportunities and research requirements for career advancement.
06.08	Explain and practice the benefits and necessity of ongoing professional development.
06.09	Examine and describe entrepreneurship and leadership opportunities as a career planning option.

CTE Standards and Benchmarks
06.10 Conduct a job search and analyze the requirements of the job.
06.11 Understand the consequences of poor decision making.
06.12 Assess the importance of confidentiality in the workplace.
06.13 Determine healthy living habits in relation to work.

Florida Department of Education
Student Performance Standards

Course Title: **Building Trades and Construction Design Technology 2**
Course Number: **8722020**
Course Credit: **1**

Course Description:

The purpose of this course is to provide students with competencies in rough and finish carpentry, masonry and painting.

CTE Standards and Benchmarks	
07.0	Demonstrate or discuss rough and finish carpentry skills. The student will be able to:
07.01	Discuss the carpentry trade and explain the duties of a carpenter.
07.02	Identify and use building materials, fasteners and adhesives.
07.03	Use and maintain hand and power tools.
07.04	Read and interpret approved plans and specifications for residential and commercial drawings.
07.05	Apply linear and distance measurements, leveling, plumbing and squaring techniques.
07.06	Analyze a survey and develop site layout.
07.07	Construct and remove concrete forms, handle and place concrete, reinforcing materials and finish concrete.
07.08	Understand the potential hazards involved in handling concrete and proper protective measures and PPE.
07.09	Calculate, layout, construct and install floor, wall, ceiling and roof framing.
07.10	Calculate, layout, construct and install basic stair layout.
07.11	Understand building science of thermal and moisture protection and mitigating measures.
07.12	Calculate and install roofing applications.
07.13	Install windows and interior /exterior doors and door hardware.
07.14	Calculate, construct and install exterior finishing.
07.15	Install drywall and apply finishing techniques.

CTE Standards and Benchmarks	
	07.16 Install cabinets and built-in fabrications.
	07.17 Calculate and install window, door, floor and ceiling trim.
	07.18 Calculate, layout and construct metal stud framing.
	07.19 Calculate, layout and install suspended ceilings.
08.0	Demonstrate or discuss masonry skills. The student will be able to:
	08.01 Describe and discuss orientations to the masonry trade.
	08.02 Identify and select basic masonry tools and equipment.
	08.03 Use, maintain and store masonry hand tools, power tools and equipment safely and in proper working order.
	08.04 Read and interpret measurements, drawings and specifications for masonry building projects.
	08.05 Demonstrate safe and proper procedures for set up/tear down and maintaining masonry work sites and projects.
	08.06 Utilize the tools and equipment used for mixing mortar.
	08.07 Analyze the factors that affect the consistency of mortar.
	08.08 Determine masonry ratios, their strengths and applications of mortar mixtures M, S, N, O and K.
	08.09 Mix various types of mortar, considering application and Pounds per Square Inch (PSI) strength.
	08.10 Lay out square corners using the 3-4-5 (or Pythagorean Theorem) and building instrument methods for masonry projects.
	08.11 Lay out and install dry bonds for masonry block corner leads projects.
	08.12 Lay out and build corner leads for masonry block projects.
	08.13 Identify and describe various masonry units and installation techniques.
	08.14 Implement the methods of putting up the line.
	08.15 Utilize pointing tools to strike mortar joints.
	08.16 Identify and use the various types of trowels.
	08.17 Mix and apply stucco to a project.

CTE Standards and Benchmarks	
09.0	Demonstrate or discuss painting and decorating skills. The student will be able to:
	09.01 Identify, describe and use various painting tools and equipment.
	09.02 Properly erect an extension ladder, step ladder and a scaffold.
	09.03 Prepare surfaces for application of finishes.
	09.04 Identify and describe various painting and application techniques.
	09.05 Apply finishes to a project including primers, paints, stains varnishes, wall coverings and textures.
	09.06 Use appropriate techniques and materials for clean-up and tool and material storage.

Florida Department of Education
Student Performance Standards

Course Title: **Building Trades and Construction Design Technology 3**
Course Number: **8722030**
Course Credit: **1**

Course Description:

The purpose of this course is to develop student competencies in construction related math and science, the built environment and the green environment.

CTE Standards and Benchmarks	
10.0	Demonstrate or discuss science knowledge and skills. The students will be able to:
10.01	Explore new technology as it applies to the construction industry in terms of materials, processes and the need for continuing education.
10.02	Investigate the use of communication technology and other resources to inspire design decisions.
11.0	Demonstrate mathematics knowledge and skills. The students will be able to:
11.01	Solve job-related problems by adding, subtracting, multiplying and dividing numbers using fractions, decimals and whole numbers.
11.02	Change fractions and decimals to percent.
11.03	Solve job-related problems using a calculator, tape measure, or on paper, for basic computations.
11.04	Read a ruler and a tape measure accurately.
11.05	Compute yards, feet, inches and fractions of inches.
11.06	Change hours and minutes to decimals, fractions and mixed numbers.
11.07	Construct charts/tables/graphs using functions and data.
11.08	Determine ratios and proportions.
11.09	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares and cylinders.
11.10	Measure tolerance(s) on horizontal and vertical surfaces using metric (centimeters and millimeters) and english (feet, inches and fractions) units.
11.11	Analyze and apply data and measurements to solve problems and interpret documents.

CTE Standards and Benchmarks	
	11.12 Calculate man hours and labor costs for a specific job.
12.0	Explain all that the built environment encompasses. The student will be able to:
	12.01 Discuss the development of construction technology, its impact on the built environment and the impact of growth on the construction industry.
	12.02 Describe and give examples of the influences and benefits of the construction industry on health and safety, communication, transportation and the economy.
	12.03 Examine and compare the relationship between the built environment and the natural environment.
	12.04 Compare the relationship between architectural designs and/or models to understand aesthetic details.
	12.05 Analyze changes in architectural styles and construction practices over time relative to various environments.
	12.06 Discuss how technology has changed the design process throughout history.
13.0	Demonstrate an understanding of the natural environment, built environment and green built environment. The student will be able to:
	13.01 Recognize and analyze the development of the built environment and its impacts on the natural environment such as pollution, deforestation, climate change, health and disease.
	13.02 Describe and give examples of how a green built environment creates growth for the construction industry, and the economy such as health and safety, transportation and natural resources.
	13.03 Examine and compare the relationship between a green built environment and the natural environment.
	13.04 Explain the purpose of the United States Green Building Council (USGBC), the Green Building Certification Institute (GBCI) and Leadership for Energy and Environmental Design (LEED) are and how they create growth for the construction industry and the economy.
	13.05 Discuss sustainable building design and its relationship between health, energy efficiency and money savings for government, businesses and individuals.
	13.06 Discuss the effects of building science on construction and energy efficiency.
	13.07 Discuss renewable fuels and energy.

Florida Department of Education
Student Performance Standards

Course Title: **Building Trades and Construction Design Technology 4**
Course Number: **8722040**
Course Credit: **1**

Course Description:

This course provides students with competencies in construction laws, contracts, documents specifications, building codes and regulations.

CTE Standards and Benchmarks	
14.0	Research laws applicable to the construction industry. The student will be able to:
14.01	Discuss and analyze the governmental law process at the federal, state and local level and its impact on the construction industry and construction education.
14.02	Identify and analyze the Codes of Federal Regulations (CFR) pertaining to the construction industry.
14.03	Analyze the Florida State Statues pertaining to the construction industry.
14.04	Compare and contrast trade union and trade non-union workers in terms of their effect and influence on health and safety, communication, transportation and the economy.
14.05	Compare and contrast employment and training with union and non-union entities in the construction industry.
14.06	Examine the role of apprenticeship in the construction industry and its impact on education.
14.07	Discuss and assess the Florida Department of Business and Professional Regulation.
14.08	Discuss and assess the Construction Industry Licensing Board, its structure, polices and requirements.
14.09	Discuss various construction occupations and explain the requirements for becoming licensed.
14.10	Compare and contrast the roles and responsibilities of the engineers, architects/designers and the general contractor.
14.11	Compare and contrast the roles and responsibilities of the general contractor, subcontractors, specialty contractors and employees of contractors.
14.12	Identify and differentiate the roles and responsibilities of building construction firms and classifications of construction projects.
14.13	Understand the process of establishing a business in the construction industry.
14.14	Assess the relationship between the Department of Labor and new construction projects, new permits and new business start-ups.

CTE Standards and Benchmarks	
	14.15 Understand zoning and assess the need for and impact of zoning requirements on construction projects.
	14.16 Examine and analyze the process of applying for building permits and variances.
15.0	Develop a basic understanding of construction contracts, drawings, documents and specifications and how they apply to the construction process. The student will be able to:
	15.01 Explain the purpose and components of contracts, drawings, documents and specifications and explain their relation to building permits.
	15.02 Analyze the importance of building codes and zoning regulations on the development of drawings and specifications.
	15.03 Identify and interpret the analogy of a full set of drawings including architectural (site plans, foundation plans, floor plans, interior/exterior elevations, sections, details, schedules, etc.), structural, plumbing, mechanical and electrical drawings.
	15.04 Utilize building symbols, drawing lines, abbreviations and scale in the development of blueprints.
	15.05 Prepare lists of materials and specifications.
	15.06 Use architectural and engineering scales.
	15.07 Demonstrate or discuss the basic use of computer-aided design software.
	15.08 Demonstrate or discuss the use of Computer-Aided Drafting (CAD) software to prepare project drawings.
	15.09 Write specifications for a project.
	15.10 Prepare construction documents for a project.

Florida Department of Education
Student Performance Standards

Course Title: **Building Trades and Construction Design Technology 5**
Course Number: **8722050**
Course Credit: **1**

Course Description:

This course provides students with competencies in electrical, plumbing and air conditioning.

CTE Standards and Benchmarks	
16.0	Demonstrate or discuss electrical rough in skills. The student will be able to:
16.01	Identify and apply electrical safety practices and procedures when working with electrical systems. (Refer to NFPA70E standards.)
16.02	Explain grounding, its purpose and relation to electrical safety.
16.03	Explain and describe various phases of electrical generation and the transportation and distribution of electricity to sub stations for industrial, business and residential uses (under 480 volts).
16.04	Design and calculate electrical loads using ohms law to determine power, American wire gauge (AWG) and electrical equipment sizes.
16.05	Apply basic electrical theory to wiring a project.
16.06	Wire an air-conditioning system, heat exchanger, heat pump or electric water heater into an electrical supply and properly size wire and overcurrent protection.
16.07	Design and install a branch circuit system in a project.
16.08	Discuss and/or install Ground Fault Circuit Interrupter (GFCI) circuitry.
16.09	Troubleshoot electrical systems, using testing and metering devices.
16.10	Install a meter, distribution panel and breaker panel for a project.
16.11	Identify types of wiring raceways (EMT/ IMC/ PVC/ MC Cable/ Romex/ SE Cable/ UF Cable).
16.12	Install conduit, pipe, shielded electrical cable and electrical boxes in a project.
17.0	Demonstrate or discuss finish electrical skills. The student will be able to:
17.01	Install electrical components relating to residential and commercial applications.

CTE Standards and Benchmarks	
	17.02 Troubleshoot and inspect electrical systems.
18.0	Demonstrate or discuss plumbing rough in skills. The student will be able to:
	18.01 Identify, select and install various pipes, tubing, fittings and connectors used in the plumbing trade for a specific project.
	18.02 Lay out and install a water distribution (supply) system for a project.
	18.03 Lay out and install a Drain, Waste and Vent (DWV) system for a project.
	18.04 Test and inspect plumbing systems.
	18.05 Discuss the design and layout of a domestic solar hot water system.
19.0	Demonstrate or discuss finish plumbing skills. The student will be able to:
	19.01 Install bathroom fixtures and hardware such as lavatories, water closets, urinals, showers, bathtubs and traps.
	19.02 Install kitchen fixtures and hardware such as sinks, garbage disposals, faucets, dishwasher, icemaker and hot water heater tanks.
20.0	Demonstrate or discuss Heating, Ventilation and Air Conditioning (HVAC) rough in skills. The student will be able to:
	20.01 Explain heating and cooling principles and code requirements.
	20.02 Perform basic calculations for heating and cooling loads.
	20.03 Develop an understanding of building envelope, insulation and ventilation.
	20.04 Select and discuss or install the components of an air conditioning system for a project including ductwork, coolant lines, compressor packages and coil packages.
	20.05 Identify and select refrigerants according to their properties.
21.0	Demonstrate finish HVAC skills. The student will be able to:
	21.01 Determine a refrigerant level.
	21.02 Install a control system for a project.
	21.03 Install registers for a project.
	21.04 Examine computer-monitoring systems associated with HVAC control systems and air-quality management.

Florida Department of Education
Student Performance Standards

Course Title: **Building Trades and Construction Design Technology 6**
Course Number: **8722060**
Course Credit: **1**

Course Description:

The purpose of this course is to allow students to apply skills learned throughout the program through a capstone project.

CTE Standards and Benchmarks	
22.0	Design a capstone project using skills learned throughout the program. The student will be able to:
22.01	Solve design and construction problems to gain new perspectives.
22.02	Apply critical-thinking and problem solving skills used in design to develop solutions for real-life issues.
22.03	Use and maintain tools and equipment used in the construction process.
22.04	Work in a project team to develop cohesiveness, team building, respectful compromise and time-management skills.
22.05	Apply carpentry skills.
22.06	Apply masonry skills.
22.07	Apply Mechanical, Electrical and Plumbing (MEP) skills.
22.08	Apply construction industry safety.
22.09	Apply sustainable construction practices.
22.10	Apply learned and acquired skills to address construction industry standards, methods and techniques.

Additional Information

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Florida Department of Education
Curriculum Framework

Program Title: **Brick and Block Masonry**
Program Type: **Career Preparatory**
Career Cluster: **Architectural and Construction**

Secondary – Career Preparatory	
Program Number	8722900
CIP Number	0646010100
Grade Level	9-12
Program Length	5 Credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-3011 -- Helpers - Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters 47-2021 -- Brickmasons and Blockmasons
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 in the brick, block, and concrete masonry industry.

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 selecting and mixing mortars, laying bricks and blocks, and interpreting construction documents.

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 totaling five credits.

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

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8722610	Masonry 1	BLDG CONST ¶ 7 ¶G TEC CONSTR ¶ 7 ¶ G TROWEL TR 7G	1 Credit	47-3011	2	CT
8722620	Masonry 2		1 Credit		2	CT
8722630	Masonry 3		1 Credit		2	CT
8722640	Masonry 4		1 Credit		2	CT
8722650	Masonry 5		1 Credit		2	CT

(Graduation Requirement Codes: CT= Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA= Mathematics, PL= Personal Financial Literacy)

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Investigate the masonry industry.
02.0 Follow safety practices relevant to the masonry industry.
03.0 Describe the properties, characteristics and uses of brick.
04.0 Describe the properties, characteristics and uses of concrete block.
05.0 Use hand tools relevant to the masonry industry.
06.0 Read measurements, drawings and specifications.
07.0 Demonstrate mathematics knowledge and skills.
08.0 Lay brick and/or block to the line.
09.0 Describe the various types and uses of bonding.
10.0 Select and mix mortars and concrete.
11.0 Demonstrate science knowledge and skills. (Optional)
12.0 Clean masonry.
13.0 Identify the various methods of masonry practices.
14.0 Erect and disassemble basic scaffolds.
15.0 Research sustainability issues related to the masonry profession.
16.0 Read construction drawings and specifications.
17.0 Construct residential masonry projects.
18.0 Apply grout and other reinforcement.
19.0 Install metals used in masonry.
20.0 Explain the importance of employability and entrepreneurship skills.
21.0 Perform building layout.
22.0 Demonstrate advanced laying techniques.
23.0 Apply construction techniques and moisture control.
24.0 Apply quality control measures.
25.0 Build foundations.
26.0 Estimate materials and cost.
27.0 Operate and maintain power equipment.

Florida Department of Education
Student Performance Standards

Course Title: **Masonry 1**
Course Number: **8722610**
Course Credit: **1**

Course Description:

This course provides students with the competencies essential to the masonry industry. These competencies include knowledge and skills related to safety practices, the use of hand tools, the selection and mixing of mortars and concrete, and brick and block laying.

CTE Standards and Benchmarks	
01.0	Investigate the masonry industry. The student will be able to:
01.01	Summarize the history of the masonry industry.
01.02	Explain the importance of the masonry industry to the local, state and national economy.
01.03	Identify employment and advancement opportunities in the masonry industry.
01.04	Explain the factors involved in good-quality work.
01.05	Describe modern masonry and materials.
02.0	Follow safety practices relevant to the masonry industry. The student will be able to:
02.01	Identify causes and types of accidents.
02.02	Explain the purpose of the Occupational Safety and Health Administration (OSHA) in jobsite safety.
02.03	Describe the OSHA "Right-to-Know" Law as recorded in (29 CFR-1910.1200)
02.04	Recognize jobsite hazards and risk assessment techniques.
02.05	Describe first-aid procedures.
02.06	Follow safety practices when using tools and equipment.
02.07	Explain the importance of hazard communications (HazCom) and Material Safety Data Sheets (MSDS).
02.08	Demonstrate the use of and care of appropriate personal protective equipment (PPE).

CTE Standards and Benchmarks	
	02.09 Demonstrate proper lifting and lowering procedures (How to properly pick up and put down materials).
03.0	Describe the properties, characteristics and uses of brick. The student will be able to:
	03.01 Explain the brick-manufacturing process.
	03.02 Identify the properties and characteristics of brick.
	03.03 Distinguish between standard and modular bricks.
	03.04 Describe the different types of bricks and their principal uses.
	03.05 Identify brick positioning in a wall.
	03.06 Build 4” brick corner return leads.
	03.07 Build a wall 4’ high and 8’ long.
04.0	Describe the properties, characteristics and uses of concrete block. The student will be able to:
	04.01 Explain the manufacturing process of concrete block.
	04.02 Identify the properties and characteristics of concrete block.
	04.03 Describe the different types, including shapes and sizes, of concrete blocks and their principal uses.
	04.04 Build an 8" block corner return lead 7 courses high.
05.0	Use hand tools relevant to the masonry industry. The student will be able to:
	05.01 Identify, care for and use basic hand tools.
	05.02 Select hand tools for specific jobs.
	05.03 Read ruler to the 1/16" increment.
	05.04 Read brick-spacing rules and/or brick modular rules.
	05.05 Course brick to a given height with the brick spacing rule and/or the modular rule.
06.0	Demonstrate understanding of measurements, drawings and specifications. The student will be able to:
	06.01 Work with denominate numbers.

CTE Standards and Benchmarks	
	06.02 Identify the ingredients and properties of mortars.
	06.03 Read a mason’s measure.
	06.04 Convert measurements in the U.S. standard (English) system into metric equivalents.
	06.05 Read construction documents and identify basic parts of a drawing set.
	06.06 Discuss the different types of specifications used in the building industry and the sections that pertain to masonry.
07.0	Demonstrate mathematics knowledge and skills. The students will be able to:
	07.01 Demonstrate knowledge of arithmetic operations.
	07.02 Analyze and apply data and measurements to solve problems and interpret documents.
	07.03 Construct charts/tables/graphs using functions and data.
08.0	Lay brick and/or block to the line. The student will be able to:
	08.01 Set up masonry materials.
	08.02 Pull a line from established leads.
	08.03 Spread mortar for brick.
	08.04 Butter head joints.
	08.05 Lay brick to the line.
	08.06 Maintain proper spacing of head and bed joints.
	08.07 Cut brick with a hammer, a brick set and a trowel.
	08.08 Point and tool joints in brick walls.
	08.09 Re-temper mortar.
	08.10 Demonstrate proper handling of materials to prevent damage.
	08.11 Repeat the above ten tasks with 8" concrete block.
09.0	Describe the various types and uses of bonding. The student will be able to:

CTE Standards and Benchmarks
09.01 Define and describe pattern, structural, layout and adhesive bonding.
09.02 Differentiate among and use stretcher, common, English, English cross, Flemish and stack bonds.

Florida Department of Education
Student Performance Standards

Course Title: **Masonry 2**
Course Number: **8722620**
Course Credit: **1**

Course Description:

This course is to develop the competencies necessary to the masonry industry. These competencies include knowledge and skills related to the properties, characteristics, and uses of brick and concrete block, bonding, methods of masonry practices, masonry cleaning and scaffolding.

CTE Standards and Benchmarks	
10.0	Select and mix mortars and concrete. The student will be able to:
10.01	Identify types of mortars and identify types to use on various concrete masonry units (CMU).
10.02	Identify the ingredients and properties of mortars.
10.03	Identify the properties and characteristics of concrete.
10.04	Identify colored mortars (admix and factory-blended).
10.05	Identify the types and purposes of grouts.
10.06	Store and place materials.
10.07	Select mortars and concrete.
10.08	Mix mortars by hand and by machine.
10.09	Mix concrete by hand and by machine.
10.10	Clean up tools, equipment and the work site.
10.11	Identify common problems found in mortar application and their uses.
11.0	Demonstrate science knowledge and skills. (Optional) The students will be able to:
11.01	Explain molecular action as a result of temperature extremes, chemical reaction and moisture content.
11.02	Explain pressure measurement in terms of Pounds per Square Inch (PSI) and inches of mercury.

CTE Standards and Benchmarks	
	11.03 Discuss the role of creativity in constructing scientific questions, methods and explanations.
	11.04 Formulate scientifically investigable questions, construct investigations, collect and evaluate data and develop scientific recommendations based on findings.
	11.05 Identify health-related problems caused by exposure to work-related chemicals and hazardous materials.
	11.06 Describe proper precautions for handling work-related chemicals and hazardous materials.
12.0	Clean masonry. The student will be able to:
	12.01 Follow safety practices when cleaning masonry.
	12.02 Identify reasons for cleaning.
	12.03 Identify and select cleaning materials and equipment for brick and concrete block.
	12.04 Prepare cleaning solutions.
	12.05 Point new and old work.
	12.06 Prepare the area and protect surrounding area from masonry cleaning solutions.
	12.07 Clean the wall using various methods.
13.0	Identify the various methods of masonry practices. The student will be able to:
	13.01 Identify the methods of basic building layouts.
	13.02 Identify the methods of digging and pouring footings.
	13.03 Identify the methods of forming, grading and pouring concrete slabs.
	13.04 Identify the different types of reinforced masonry, flashing, wall reinforcement and ties and use proper technique for installation.
	13.05 Identify measuring tools.
	13.06 Identify power equipment.
14.0	Erect and disassemble basic scaffolds. The student will be able to:
	14.01 Follow safety practices when working with ladders and scaffolds.
	14.02 Erect and disassemble basic scaffolds.

CTE Standards and Benchmarks	
15.0	Research sustainability issues related to the masonry profession. The student will be able to:
15.01	Describe the impact of the construction industry on the natural environment.
15.02	Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.
15.03	Identify and analyze sustainable alternatives to conventional masonry practices.
15.04	Identify specific practices that can lessen adverse impacts on the environment.
15.05	Describe the building assessment tools such as Leadership in Energy and Environmental Design (LEED) and Green Globes.
15.06	Identify construction activities pertaining to the masonry profession that contribute to a project's overall sustainability.

Florida Department of Education
Student Performance Standards

Course Title: **Masonry 3**
Course Number: **8722630**
Course Credit: **1**

Course Description:

This course provides students with competencies plan reading, residential masonry, masonry reinforcement and metals used in masonry.

CTE Standards and Benchmarks	
16.0	Read construction drawings and specifications. The student will be able to:
16.01	Identify types of drawings.
16.02	Identify symbols on the drawings.
16.03	Read and interpret simple drawings.
16.04	Read and interpret specifications.
16.05	Explain the importance of following local, state and national codes and standards.
16.06	Interpret a finished schedule.
16.07	Use an architect's scale.
16.08	Use construction drawings to estimate material quantities.
16.09	Demonstrate ability to make simple sketches.
17.0	Construct residential masonry projects. The students will be able to:
17.01	Explain the requirements for construction of various types of residential foundations.
17.02	Identify and explain the characteristics, uses and installation techniques for brick pavers.
17.03	Lay out and build steps, patios and decks made from masonry units.
17.04	Describe the process of tying brick veneer to an established wall.
18.0	Apply grout and other reinforcement. The students will be able to:

CTE Standards and Benchmarks	
	18.01 Name and describe the primary ingredients in grout and their properties.
	18.02 Identify the different types of grout used in masonry work.
	18.03 Describe common admixtures and their uses.
	18.04 Describe the use of steel bar reinforcement in masonry construction.
	18.05 Apply grout in low and high lifts using the proper techniques. (Optional)
	18.06 Place grout in a hollow block wall and rod it into place. (Optional)
19.0	Install metals used in masonry. The students will be able to:
	19.01 Describe the uses and installation of vertical reinforcement.
	19.02 Describe the uses and installation of different types of horizontal joint reinforcement and ties.
	19.03 Describe the uses and installation of different anchors, fasteners and embedded items.
	19.04 Describe and/or install hollow metal frames.
	19.05 Describe the functions of sills and lintels.
	19.06 Describe and/or install metal hardware.

Florida Department of Education
Student Performance Standards

Course Title: **Masonry 4**
Course Number: **8722640**
Course Credit: **1**

Course Description:

This course is designed to provide students with competencies in building layout, advanced laying techniques, moisture control and quality control.

CTE Standards and Benchmarks	
20.0	Explain the importance of employability and entrepreneurship skills. The students will be able to:
20.01	Identify and demonstrate positive work behaviors needed to be employable.
20.02	Develop personal career plan that includes goals, objectives and strategies.
20.03	Examine licensing, certification and industry credentialing requirements.
20.04	Maintain a career portfolio to document knowledge, skills and experience.
20.05	Evaluate and compare employment opportunities that match career goals.
20.06	Demonstrate ability to complete job applications and make a resume.
20.07	Identify and exhibit traits for retaining employment.
20.08	Identify opportunities and research requirements for career advancement.
20.09	Research the benefits of ongoing professional development.
20.10	Examine and describe entrepreneurship opportunities as a career planning option.
21.0	Perform building layout. The student will be able to:
21.01	Read and interpret plot plans.
21.02	Establish building corners.
21.03	Check and/or establish 90-degree angles using the 3-4-5 rule.
21.04	Use optical and laser leveling instruments, transit and leveling rod.

CTE Standards and Benchmarks	
	21.05 Describe how to build batter boards and establish building lines and elevations.
	21.06 Describe how to dig, prepare and pour footings to local codes and standards.
22.0	Demonstrate advanced laying techniques. The student will be able to:
	22.01 Recognize the structural principles and fundamental uses of basic types of walls.
	22.02 Recognize the requirement for and function of control joints and expansion joints.
	22.03 Describe the various types of walls using proper reinforcement, jointing and bonding techniques.
	22.04 Describe how to lay out specialty structures such as maintenance holes, segmented block walls and screens.
	22.05 Identify and explain the different types of masonry arches used today.
	22.06 Lay out a semicircular arch and a jack arch. (Optional)
	22.07 Lay out and build chimneys and fireplaces. (Optional)
23.0	Apply construction techniques and moisture control. The student will be able to:
	23.01 Construct or describe the process of placing masonry around windows, doors and other openings.
	23.02 Construct or describe the process of building pilasters and other types of bracing.
	23.03 Construct or describe the process of installing insulation used in conjunction with masonry construction.
	23.04 Identify the need for moisture control in various types of masonry construction and describe the techniques used to eliminate moisture problems.
	23.05 Construct or describe the process of building corbelling in a double-wythe wall.
	23.06 Construct or describe the process of joining intersecting walls.
	23.07 Construct or describe the process of installing flashing.
24.0	Apply quality control measures. The student will be able to:
	24.01 Describe industry standards for quality control.
	24.02 Describe how to build masonry sample panels and prisms.
	24.03 Perform a slump test.

CTE Standards and Benchmarks
24.04 Describe and perform field inspections.

Florida Department of Education
Student Performance Standards

Course Title: **8722650**
Course Number: **Masonry 5**
Course Credit: **1**

Course Description:

This course provides students with an in-depth study of foundation building, materials and cost estimations and power-equipment operation.

CTE Standards and Benchmarks	
25.0	Build foundations. The student will be able to:
25.01	Build an 8" block corner 7 courses high.
25.02	Build an 8" block corner to the correct height and range of a given foundation batter board line. (Optional)
25.03	Bond and build an 8" block corner to the correct height and range on the opposite corner of a given foundation batter board line.
25.04	Pull a line and build an 8" block wall between the block corners.
25.05	Establish and build the other corner leads.
25.06	Build or describe the process of building foundation walls to floor elevations.
25.07	Describe the process of making foundation walls waterproof, if required.
25.08	Describe the process of installing flashing, anchor bolts, termite shields and weep holes; install vents (if a wooden floor system is used).
26.0	Estimate materials and cost. The student will be able to:
26.01	Estimate the materials needed for a specific job.
26.02	Estimate the cost of the materials, labor, unit/ labor costs and sales tax.
27.0	Operate and maintain power equipment. The student will be able to:
27.01	Follow safety practices when using and maintaining power equipment.
27.02	Use masonry saw with an abrasive blade to cut masonry units.
27.03	Use masonry saw with a diamond blade to cut masonry units.

CTE Standards and Benchmarks
27.04 Set up, operate and maintain power tools and equipment (mixer, hand held saw, drill, etc.).

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.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. 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 IEP served in Exceptional Student Education (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 and regulated secondary programs 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 course or a modified course. 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 a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. 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.

Florida Department of Education
Curriculum Framework

Program Title: **Air Conditioning, Refrigeration and Heating Technology**
Program Type: **Career Preparatory**
Career Cluster: **Architecture & Construction**

Secondary – Career Preparatory	
Program Number	8723000
CIP Number	0647020303
Grade Level	9-12
Program Length	7 Credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9021 -- Heating, Air Conditioning, and Refrigeration Mechanics and Installers
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 or advanced training in the heating, ventilation, air-conditioning and refrigeration industry. The student should obtain EPA certification prior to leaving school in order to be employed in any job that requires work with refrigerants.

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 & 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 & Construction career cluster.

The content includes but is not limited to designing, testing and repairing heating, ventilation, air-conditioning and cooling (HVAC) systems.

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 totaling seven credits.

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

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8713010	Air Conditioning, Refrigeration & Heating Technology 1	AC HEAT ME @7 7G REFRG MECH 7 G	1 Credit	49-9021	2	CT
8713020	Air Conditioning, Refrigeration & Heating Technology 2		1 Credit		2	CT
8713030	Air Conditioning, Refrigeration & Heating Technology 3		1 Credit		2	CT
8713040	Air Conditioning, Refrigeration & Heating Technology 4		1 Credit		2	CT
8713050	Air Conditioning, Refrigeration & Heating Technology 5		1 Credit		2	CT
8713060	Air Conditioning, Refrigeration & Heating Technology 6		1 Credit		2	CT
8713070	Air Conditioning, Refrigeration & Heating Technology 7		1 Credit		2	CT

(Graduation Requirement Codes: CT= Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA= Mathematics, PL= Personal Financial Literacy)

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
02.0 Explain the importance of employability and entrepreneurship skills.
03.0 Identify, use and maintain the tools and tool accessories used in the HVAC/R industry and those used in related construction trades.
04.0 Demonstrate mathematics and science knowledge and skills.
05.0 Read and interpret construction documents to understand HVAC/R and other related trade requirements.
06.0 Explain the properties of matter and heat behavior.
07.0 Describe the history and concepts of HVAC/R.
08.0 Demonstrate a practical knowledge of basic electricity and of the electrical components of HVAC/R equipment.
09.0 Demonstrate knowledge of electrical wiring in HVAC/R.
10.0 Utilize and operate mechanical refrigeration servicing and testing equipment.
11.0 Assist in the installation of a residential HVAC system and determine start-up procedures.
12.0 Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems.
13.0 Use combustion-type heating servicing and testing equipment.
14.0 Troubleshoot combustion gas valves and regulators as used in HVAC/R systems.
15.0 Troubleshoot HVAC/R electrical control systems and their components.
16.0 Select and test electrical generation and distribution components for commercial and residential HVAC/R systems.
17.0 Analyze fluids, pressures, refrigerants and related codes.
18.0 Evaluate HVAC/R system components and accessories.
19.0 Fabricate and service the piping, tubing and fittings used in the HVAC/R industry.
20.0 Maintain, test and troubleshoot electrical motors and their components for commercial HVAC/R systems.
21.0 Explain the standards for and ways to measure indoor air quality.
22.0 Develop an understanding of chilled systems.
23.0 Make career plans.
24.0 Utilize mechanical components of HVAC/R systems.
25.0 Operate solid-state electronics as used in HVAC/R systems.
26.0 Understand the design of heating and cooling systems.
27.0 Use a pressure enthalpy chart to diagram refrigerant cycles.
28.0 Maintain, troubleshoot and repair residential HVAC systems.
29.0 Select appropriate commercial compressors.
30.0 Test and adjust commercial evaporative condensers.
31.0 Maintain, test and troubleshoot commercial evaporators.
32.0 Identify basic principles of HVAC/R piping sizing.
33.0 Maintain, troubleshoot and repair commercial heating systems.
34.0 Discuss new technologies.
35.0 Interpret, use and modify construction drawings and documents.
36.0 Troubleshoot and repair commercial heating and air-conditioning systems.

Florida Department of Education
Student Performance Standards

Course Title: **Air Conditioning, Refrigeration and Heating Technology 1**
Course Number: **8713010**
Course Credit: **1**

Course Description:

This course provides students with competencies in the following topics essential to the air-conditioning, refrigeration and heating industry: safety practices; employability skills; materials and tools; mathematics; science; and construction documents.

CTE Standards and Benchmarks	
01.0	Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
01.01	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.02	Explain the reasons for regular safety meetings and for company safety policies.
01.03	Explain the need for employee-background checks and medical examinations.
01.04	Identify appropriate fire extinguishers and other such safety devices.
01.05	Identify and follow emergency and rescue procedures.
01.06	Identify and use safe-handling practices as they relate to hazardous and volatile fluids, compounds and gases.
01.07	Demonstrate Occupational Safety and Health Administration (OSHA) 10, Environmental Protection Agency (EPA) practices, Department of Transportation (DOT) hazardous materials safety requirements, lock-out and tag out, and electrical safety.
01.08	Select and wear proper protective clothing and equipment.
01.09	Describe the purpose and requirements of local, state and federal heating, ventilation, air-conditioning and refrigeration (HVAC/R) codes and standards as well as the manufacturer's installation instructions.
01.10	Identify and use OSHA practices when working with heating, air-conditioning and refrigeration systems and equipment.
01.11	Explain emergency procedures to follow in response to workplace accidents.
01.12	Understand a disaster and/or emergency response plan.
02.0	Explain the importance of employability and entrepreneurship skills. The student will be able to:
02.01	Identify and demonstrate positive work behaviors needed to be employable.

CTE Standards and Benchmarks	
	02.02 Develop personal career plan that includes goals, objectives and strategies.
	02.03 Create and maintain a career portfolio of work, including a resume, to document knowledge, skills and experience.
	02.04 Learn how to manage finances and understand loans, debt, overhead, and other fundamental business concepts. (Optional)
	02.05 Create and maintain a budget for business planning needs and, optionally, for personal needs.
	02.06 Understand how to create service reports, invoices, estimates, and other related documentation.
	02.07 Understand and apply proper customer relationship skills.
03.0	Identify, use and maintain the tools and tool accessories used in the HVAC/R industry and those used in related construction trades. The student will be able to:
	03.01 Follow safety precautions when using hand and power tools.
	03.02 Identify and use basic hand tools and tool accessories; power tools (electric and mechanical); pipe and tube-working tools; and specialized tools of the HVAC/R industry and related trades.
	03.03 Apply appropriate care and maintenance procedures for tools and tool accessories, following the directions in the tool-equipment manufacturer's manual.
04.0	Demonstrate mathematics and science knowledge and skills. The student will be able to:
	04.01 Demonstrate knowledge of arithmetic operations.
	04.02 Demonstrate knowledge of how to use the appropriate levels of algebra, geometry and optionally, trigonometry to successfully calculate and evaluate information.
	04.03 Demonstrate knowledge of basic physical sciences, including chemistry and physics.
	04.04 Demonstrate an understanding of how to make proper calculations for the refrigeration process and for heat gain load calculations.
	04.05 Analyze and apply data and measurements to solve problems and interpret documents.
05.0	Read and interpret construction documents to understand HVAC/R and other related trade requirements. The student will be able to:
	05.01 Recognize and identify basic construction drawings and document terms, components and symbols.
	05.02 Relate information on construction drawings to actual locations on the project.
	05.03 Recognize different classifications of construction drawings and documents for various trades.
	05.04 Interpret and use drawing dimensions.
	05.05 Demonstrate imaginative or innovative solutions for a design project.

CTE Standards and Benchmarks	
05.06	Apply critical thinking and problem solving skills used in HVAC/R and related construction trades to develop solutions for real-world issues.

Florida Department of Education
Student Performance Standards

Course Title: **Air Conditioning, Refrigeration and Heating Technology 2**
Course Number: **8713020**
Course Credit: **1**

Course Description:

This course provides students with competencies in the following topics essential to the air-conditioning, refrigeration and heating industry: matter and heat behavior; history; basic electricity; electrical wiring; mechanical refrigeration; mechanical heating and air-conditioning systems; combustion-type heating; and troubleshooting.

CTE Standards and Benchmarks	
06.0	Explain the properties of matter and heat behavior. The student will be able to:
06.01	Describe and explain freezing point, critical temperature and absolute zero.
06.02	Explain the gas laws (Dalton, Boyle and Charles) used when dealing with air and its properties and be able to make calculations and conversions using these laws.
06.03	Describe matter, heat and heat transfer and understand radiant, convection, and conduction heat.
06.04	Differentiate between heat and temperature.
06.05	Explain and distinguish among the characteristics of the three states of matter.
06.06	Explain the relationship between temperature and humidity.
06.07	Differentiate between latent heat and sensible heat.
07.0	Describe the history and concepts of HVAC/R. The student will be able to:
07.01	Explain the basic principles of heating, ventilation and air-conditioning.
07.02	Identify the refrigeration cycle.
07.03	Identify and explain the four major refrigeration components.
07.04	Identify and explain the characteristics of a compression-cycle refrigerant system.
07.05	Differentiate between air-conditioning and refrigeration.
07.06	Differentiate between split systems, mini-splits and package systems.

CTE Standards and Benchmarks	
	07.07 Describe the benefits of conditioned air and indoor air quality.
	07.08 Identify various professional organizations, associations and societies and explain their purposes.
08.0	Demonstrate a practical knowledge of basic electricity and of the electrical components of HVAC/R equipment. The student will be able to:
	08.01 Explain the principles of electricity.
	08.02 Explain single- and three-phase power distribution.
	08.03 Explain and understand the electrical generation and distribution process.
	08.04 Define and explain, and calculate watts, ohms, volts and amps.
	08.05 Identify, diagnose, repair or replace distribution panels and fusible disconnects.
	08.06 Identify and explain electrical measuring tools and devices.
	08.07 Explain the standards for and ways to measure watts, resistance, voltage and amperage, using appropriate instruments or devices.
09.0	Demonstrate knowledge of electrical wiring in HVAC/R. The student will be able to:
	09.01 Identify and explain appropriate electrical wiring symbols.
	09.02 Draw and explain a wiring schematic diagram for a control system.
	09.03 Create and draw a wiring schematic of the HVAC/R equipment and surrounding accessories as required by code.
	09.04 Explain the purposes and procedures for protecting piping materials and fabrication, such as valves, fittings and products from heat.
10.0	Utilize and operate mechanical refrigeration servicing and testing equipment. The student will be able to:
	10.01 Identify the effects of superheat and sub-cooling on a system.
	10.02 Identify and explain the functions of servicing and testing equipment (such as vacuum pumps, micron gauges, EPA-approved equipment, leak detectors and charging systems).
	10.03 Operate a refrigerant recovery system.
	10.04 Apply specific safety and recovery practices for refrigerants used in the industry.
	10.05 Apply specific safety practices as they relate to handling and storing cylinders and materials.
	10.06 Explain the standards for and ways to measure, test, maintain and evacuate a mechanical HVAC/R system.

CTE Standards and Benchmarks	
	10.07 Evacuate the refrigerant system with various vacuum methods.
	10.08 Demonstrate compliance with Environmental Protection Agency (EPA) rules and regulations and, if possible, take the EPA 608 certification tests for core, type I, II, and III.
	10.09 Charge various air-conditioning and mechanical refrigeration systems by various methods.
	10.10 Demonstrate the effects of superheat and sub-cooling on a system utilizing test equipment (such as thermometers and gages).
11.0	Assist in the installation of a residential HVAC system and determine start-up procedures. The student will be able to:
	11.01 Read and comply with dispatch orders.
	11.02 Explain codes and ordinances.
	11.03 Assist in the installation of a HVAC system to the manufacturer's installation and operation specifications, using a practical knowledge of duct fabrication methods.
	11.04 Determine which charging method is appropriate for a given type of system in a residential air-conditioning unit and adjust superheat and/or sub-cooling.
	11.05 Determine the temperature split/difference across the evaporator.
	11.06 Determine the temperature split/difference across the condenser.
	11.07 Explain the electrical and mechanical operations of the basic heat pump.
12.0	Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems. The student will be able to:
	12.01 Identify and explain the following heat-pump systems: air-to-air, water-to-air, water-to-water, air-to-ground (geothermal), open-loop and closed-loop.
	12.02 Determine the start-up and checkout procedures recommended by different manufacturers.
	12.03 Determine the temperature split/ difference across the outdoor coil on a heat pump.
	12.04 Determine the temperature split/ difference across the indoor coil on a heat pump.
13.0	Use combustion-type heating servicing and testing equipment. The student will be able to:
	13.01 Explain combustion theory and the safety precautions for using combustion-type-heating servicing and testing equipment.
	13.02 Identify and explain the various types of combustion-type heating servicing and testing equipment (such as draft gauge, U-tube manometer, sling psychrometer, millivolt meter and oil-furnace testing equipment).
	13.03 Use the servicing and testing equipment.

CTE Standards and Benchmarks	
	13.04 Test, analyze and troubleshoot combustion-type-heating systems.
14.0	Troubleshoot combustion gas valves and regulators as used in HVAC/R systems. The student will be able to:
	14.01 Identify and discuss the safety and regulation issues and concerns.
	14.02 Explain the operations of various types of gas valves and regulators (such as low-voltage, line-voltage, pneumatic (optional), solenoid and gas and pressure regulators).
	14.03 Identify various types of gas valves and regulators.
	14.04 Determine the application of gas valves and regulators.
	14.05 Troubleshoot gas valves and regulators.

Florida Department of Education
Student Performance Standards

Course Title: **Air Conditioning, Refrigeration and Heating Technology 3**
Course Number: **8713030**
Course Credit: **1**

Course Description:

This course provides students with competencies in the following topics essential to the air-conditioning, refrigeration and heating industry: electrical control systems and components; electrical generation and distribution components; fluids, pressures, refrigerants and codes; system components and accessories; piping, tubing and fittings; electrical motors; indoor-air quality; chilled systems; and career planning.

CTE Standards and Benchmarks	
15.0	Troubleshoot HVAC/R electrical control systems and their components. The student will be able to:
15.01	Identify and explain the operations of electrical control systems and their components (e.g., zone damper motors, contactors, relays, circuit boards, motors, solenoids, thermostats, etc.).
15.02	Troubleshoot protection devices, such as fuses and breakers.
15.03	Identify, install and troubleshoot controls for HVAC/R systems.
15.04	Explain the operation of different types of electromechanical communicating, humidity control, and Wi-Fi and programmable operating thermostats.
15.05	Troubleshoot operational problems for different types of electromechanical communicating, humidity control, and Wi-Fi operating thermostats.
16.0	Select and test electrical generation and distribution components for commercial and residential HVAC/R systems. The student will be able to:
16.01	Determine wire sizes and voltage drops.
16.02	Describe the operation of various types of transformers.
17.0	Analyze fluids, pressures, refrigerants and related codes. The student will be able to:
17.01	Identify and explain general safety issues and EPA rules and regulations regarding the handling of refrigerants.
17.02	Define and explain pressure, fluid and temperature.
17.03	Explain the standards for and ways to measure and calculate absolute and gauge pressures.
17.04	Identify and explain the classifications, properties and uses of different refrigerants based on chemical composition.

CTE Standards and Benchmarks	
	17.05 Explain how fluids react and flow in a closed versus an open environment or vessel.
	17.06 Define and identify "color-coding" of refrigerant cylinders.
	17.07 Explain the proper methods of transferring, storing and recovering refrigerants.
	17.08 Explain the effects of an improper refrigerant and contaminants in a system.
	17.09 Identify the refrigerants in common use and state the types of applications in which each is used.
	17.10 Describe how azeotropes and near-azeotropes differ from each other and from so-called pure refrigerants.
	17.11 Compare and interpret a Pressure/Temperature (P/T) chart for pure refrigerants, azeotrope, and near-azeotrope refrigerants and explain the difference between bubble point and dew point.
	17.12 Demonstrate refrigerant leak detecting methods.
	17.13 Identify the different types of oils used in refrigeration systems and explain their relationships to the various refrigerants.
	17.14 Explain how to add and remove oil from a system.
	17.15 Describe how to test oil and acid for contamination.
18.0	Evaluate HVAC/R system components and accessories. The student will be able to:
	18.01 Explain the types, operation, use and requirements of:
	• Compressors (such as reciprocating, rotary, screw, scroll and inverter)
	• Condensers and evaporators (such as evaporative condensers, evaporative coils, shell and tube, tube within a tube and fin and tube)
	• Metering devices (such as adjusting automatic and thermostatic expansion valves, fixed orifices, stepper motor electronic expansion valve (EEV), solenoid EEV and other devices available on the local market)
	18.02 Identify the location and explain the uses of refrigerant flow accessories.
	18.03 Identify the location and explain the uses of HVAC/R system accessories (such as receivers, dryers/filers, solenoid valves, heat exchangers, accumulators, suction filter, oil separators, evaporator pressure-regulating valve, crankcase pressure-regulating valves, hot gas bypass valves and check valves).
19.0	Fabricate and service the piping, tubing and fittings used in the HVAC/R industry. The student will be able to:
	19.01 Identify and explain the purpose of the piping, tubing and fittings used for electrical, gas, exhaust and drain components.
	19.02 Bend tubing, using tube benders.

CTE Standards and Benchmarks	
	19.03 Connect tubing using flared fittings, pressed fittings and compression fittings.
	19.04 Connect tubing, using a swaged-joint connection.
	19.05 Explain the purposes and procedures for protecting piping materials and fabrication, such as valves, fittings and products from heat.
	19.06 Identify and use various types of torches.
	19.07 Identify, select and use appropriate brazing alloys, materials and skills.
	19.08 Explain the purposes and procedures for protecting piping materials and fabrication, such as valves, fittings and products from heat.
	19.09 Braze tubing while purging dry nitrogen.
	19.10 Silver-braze brass, steels and copper.
	19.11 Demonstrate an understanding of the procedures for installing pipe and tubing insulation.
	19.12 Explain the procedures required for installing HVAC/R accessories.
	19.13 Fabricate and leak-test the piping, tubing and fittings used in the HVAC/R industry.
	19.14 Demonstrate proper safety measures when fabricating and servicing piping, tubing and fittings.
20.0	Maintain, test and troubleshoot electrical motors and their components for commercial HVAC/R systems. The student will be able to:
	20.01 Explain how alternating current is developed and draw a sine wave.
	20.02 Identify single-phase and three-phase wiring arrangements.
	20.03 Explain how phase shift occurs in inductors and capacitors.
	20.04 Describe the types of capacitors and their applications.
	20.05 Explain the operation of single-phase and three-phase induction motors.
	20.06 Identify and explain the operations and applications of various types of electrical motors and their components as used in HVAC/R systems.
	20.07 Maintain, test and troubleshoot various types of electrical motors and their components as used in HVAC/R systems.
	20.08 Demonstrate the proper use of motor testing equipment.
	20.09 Reverse the rotation of a motor.

CTE Standards and Benchmarks	
21.0	Explain the standards for and ways to measure indoor air quality. The student will be able to:
21.01	Identify and explain the codes and standards regarding indoor air quality.
21.02	Select and use indoor air quality measuring devices.
21.03	Explain the standards for and ways to measure indoor air quality using various methods.
22.0	Develop an understanding of chilled systems. The student will be able to:
22.01	Explain the terms and concepts used when working with chilled-water cooling systems.
22.02	Identify the major components of chilled-water cooling and dual-temperature water systems.
22.03	Explain the purpose of each component of chilled-water cooling and dual-temperature water systems.
22.04	Describe the safety precautions used when working with chilled-water systems.
22.05	Explain the differences between reciprocating, rotary screw, scroll and centrifugal chillers.
23.0	Make career plans. The student will be able to:
23.01	Evaluate and compare employment opportunities that match career goals.
23.02	Identify and exhibit traits for retaining employment.
23.03	Identify opportunities and research requirements for career advancement.
23.04	Research the benefits of ongoing professional development.
23.05	Examine licensing, certification and industry credentialing requirements.

Florida Department of Education
Student Performance Standards

Course Title: **Air Conditioning, Refrigeration and Heating Technology 4**
Course Number: **8713040**
Course Credit: **1**

Course Description:

This course provides students with competencies in the following topics essential to the air-conditioning, refrigeration and heating industry: mechanical components; solid-state electronics; design of heating and cooling systems; and refrigerant cycles; and maintaining, troubleshooting and repairing heating and cooling systems.

CTE Standards and Benchmarks	
24.0	Utilize mechanical components of HVAC/R systems. The student will be able to:
24.01	Evaluate metering-device performance.
24.02	Explain the methods of compression, lubrication and compressor modulation.
24.03	Analyze the operating condition of a compressor.
24.04	Test, troubleshoot and correct the causes of mechanical problems in a HVAC/R system.
24.05	Evaluate system performance.
25.0	Operate solid-state electronics as used in HVAC/R systems. The student will be able to:
25.01	Explain the basic principles and functions of Direct Digital Control (DDC).
25.02	Explain basic solid-state circuits and boards.
25.03	Identify, test and replace circuits and boards.
25.04	Explain codes and standards and safety requirements for working with the electrical components used HVAC/R.
26.0	Understand the design of heating and cooling systems. The student will be able to:
26.01	Identify and describe the steps in the system design process.
26.02	Use construction drawings and documents from a job site to obtain information needed to complete heating and cooling load estimates.
26.03	Identify the factors that affect heat gains and losses to a building and describe how these factors influence the design process.

CTE Standards and Benchmarks	
	26.04 Complete a load estimate to determine the heating and/or cooling load of a building.
	26.05 State the principles that affect the selection of equipment to satisfy the calculated heating and/or cooling load.
	26.06 Select heating and/or cooling equipment using manufacturers' product data.
	26.07 Identify the various types of duct systems and explain why and where each type is used.
	26.08 Demonstrate the effect of fittings and transitions on duct system design.
	26.09 Use a friction loss chart and duct sizing table to size duct.
	26.10 Install insulation and vapor barriers used in duct systems.
	26.11 Select and install refrigerant and condensate piping following proper design principles.
	26.12 Describe airflow and pressures in a basic forced-air distribution system.
	26.13 Explain the differences between propeller and centrifugal fans and blowers.
	26.14 Identify the various types of duct systems and explain why and where each type is used.
	26.15 Demonstrate or explain the installation of metal, fiberboard and flexible duct.
	26.16 Demonstrate or explain the installation of fittings and transitions used in duct systems.
	26.17 Identify and explain the operations of electrical control systems and their components (zone damper motors).
	26.18 Demonstrate or explain the use and installation of dampers used in duct systems.
	26.19 Demonstrate or explain the use and installation of insulation and vapor barriers used in duct systems.
	26.20 Identify instruments used to make measurements in air systems and explain the use of each instrument.
	26.21 Make basic temperature, air pressure and velocity measurements in an air distribution system.
27.0	Use a pressure enthalpy chart to diagram refrigerant cycles. The student will be able to:
	27.01 Define enthalpy and entropy.
	27.02 Identify all components of the pressure enthalpy chart.
28.0	Maintain, troubleshoot and repair residential HVAC systems. The student will be able to:

CTE Standards and Benchmarks
28.01 Identify the components of various residential HVAC systems.
28.02 Explain the operational principles of various residential HVAC systems.
28.03 Test and analyze residential HVAC air-distribution systems.
28.04 Apply local and national codes and safety practices.
28.05 Lay out a residential HVAC system.
28.06 Lay out a typical split residential HVAC system.
28.07 Maintain, test, analyze and repair various types of residential HVAC systems.
28.08 Keep a record of the installation, maintenance and repair of residential HVAC systems.
28.09 Maintain, troubleshoot and repair water-cooled condensers. (Optional)

Florida Department of Education
Student Performance Standards

Course Title: **Air Conditioning, Refrigeration and Heating Technology 5**
Course Number: **8713050**
Course Credit: **1**

Course Description:

This course provides students with competencies in the following topics essential to the air-conditioning, refrigeration and heating industry: selection, testing and maintenance of commercial compressors.

CTE Standards and Benchmarks	
29.0	Select appropriate commercial compressors. The student will be able to:
29.01	Compare commercial-compressor requirements with those for residential and light commercial HVAC systems.
29.02	Discuss appropriate commercial compressors for cooling requirements.
29.03	Describe the mechanical operation for each type of compressor.
29.04	Explain compressor lubrication methods.
29.05	Explain methods used to control compressor capacity.
29.06	Describe how compressor protection devices operate.
29.07	Perform the common procedures used when field servicing open and semi-hermetic compressors.
30.0	Test and adjust commercial evaporative condensers. The student will be able to:
30.01	Determine the proper air and fluid flow for commercial evaporative condensers.
30.02	Test and adjust the airflow for proper temperature difference.
30.03	Test and adjust the water flow for proper Gallons Per Minute (GPM) and temperature difference.
30.04	Check for proper water treatment.
31.0	Maintain, test and troubleshoot commercial evaporators. The student will be able to:
31.01	Determine the operational requirements for evaporators used in commercial HVAC applications.

CTE Standards and Benchmarks
31.02 Discuss appropriate evaporators for commercial HVAC systems
31.03 Maintain, test and adjust commercial HVAC accessories.
31.04 Select the HVAC accessories appropriate for various commercial applications.

Florida Department of Education
Student Performance Standards

Course Title: **Air Conditioning, Refrigeration and Heating Technology 6**
Course Number: **8713060**
Course Credit: **1**

Course Description:

This course provides students with competencies in the following topics essential to the air-conditioning, refrigeration and heating industry: ventilation piping sizing; and maintaining, troubleshooting and repairing commercial heating systems.

CTE Standards and Benchmarks	
32.0	Identify basic principles of HVAC/R piping sizing. The student will be able to:
32.01	Identify and explain various types of HVAC/R piping.
32.02	Identify basic principles of sizing various HVAC/R for various tasks.
32.03	Explain pressure and temperature drops.
33.0	Maintain, troubleshoot and repair commercial heating systems. The student will be able to:
33.01	Identify the components of various commercial heating systems.
33.02	Explain the operational principles of various commercial heating systems.
33.03	Test and analyze heating air-distribution systems.
33.04	Maintain, troubleshoot and repair various types of commercial heating systems.

Florida Department of Education
Student Performance Standards

Course Title: **Air Conditioning, Refrigeration and Heating Technology 7**
Course Number: **8713070**
Course Credit: **1**

Course Description:

This course provides students with competencies in the following topics essential to the air-conditioning, refrigeration and heating industry: new technologies; construction drawings and documents; and troubleshooting and repairing commercial heating and air-conditioning systems.

CTE Standards and Benchmarks	
34.0	Discuss new technologies. The student will be able to:
34.01	Follow safety precautions.
34.02	Describe new technologies in HVAC/R installation, including variable-speed motors, heat-pipe systems, desiccant systems and gas-driven heating systems.
34.03	Describe multi-ports and variable refrigerant volume (VRV)/variable refrigerant flow (VRF) systems.
34.04	Explain how to lay out, construct and troubleshoot comfort systems.
34.05	Test and analyze systems.
34.06	Test and analyze heat-recovery systems and variable refrigerant volume (VRV)/variable refrigerant flow (VRF).
35.0	Interpret, use and modify construction drawings and documents. The student will be able to:
35.01	Read mechanical plans within a set of construction drawings and explain their relationship.
35.02	Compare mechanical plans with the actual installation of duct and pipe runs, fittings and sections.
35.03	Interpret shop drawings and apply them to mechanical plans and specification documents.
35.04	Develop a field set of as-built drawings.
35.05	Identify the steps required for transferring design information to component production.
35.06	List and classify materials most commonly used in HVAC/R systems.
36.0	Troubleshoot and repair commercial heating and air-conditioning systems. The student will be able to:

CTE Standards and Benchmarks
36.01 Keep a record of the installation, maintenance and repair of commercial heating and air-conditioning systems.
36.02 Apply local and national codes and safety practices.
36.03 Lay out a commercial heating and air-conditioning system.
36.04 Lay out a typical split commercial air-conditioning system.
36.05 Lay out a typical split commercial heating system.
36.06 Maintain, test, analyze and repair various types of commercial heating and air-conditioning systems.
36.07 Maintain, troubleshoot and repair water-cooled condensers

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.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. 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 IEP served in Exceptional Student Education (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 and regulated secondary programs 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 course or a modified course. 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 a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. 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.

Florida Department of Education
Curriculum Framework

Program Title: **Drafting**
Program Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

Secondary – Career Preparatory	
Program Number	8725000
CIP Number	0648010102
Grade Level	9-12
Program Length	4 Credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3011 -- Architectural and Civil Drafters
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 or advanced training in the drafting industry. After completing courses in this program, students may elect to continue their studies through courses offered in the Architectural Drafting, Mechanical Drafting or Structural Drafting programs.

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 freehand sketching, drafting by hand and computer and 3D modeling.

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 totaling four credits. The four courses, Drafting 1, 2, 3, 4, are considered core courses for the other secondary Drafting programs.

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

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8725010	Drafting 1	BLDG CONSTR @7 7G DRAFTING @7 7G TEC DRAFT 7G TEC CONSTR @7 7G	1 Credit	17-3011	3	CT
8725020	Drafting 2		1 Credit		3	CT
8725030	Drafting 3		1 Credit		3	CT
8725040	Drafting 4		1 Credit		3	CT

(Graduation Requirement Codes: CT= Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA= Mathematics, PL= Personal Financial Literacy)

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Apply basic drafting, sketching and Computer-Aided Drawing (CAD) techniques and skills.
02.0 Apply the design procedures.
03.0 Design and prepare multi-view drawings using 2D sketching and/or CAD software.
04.0 Prepare sectional views using 2D sketching and/or CAD software.
05.0 Prepare auxiliary drawings using 2D sketching and/or CAD software.
06.0 Apply basic dimensioning and annotation using 2D sketching and/or CAD software.
07.0 Prepare working drawings.
08.0 Prepare pictorial drawings using 2D sketching and/or CAD software.
09.0 Prepare surface developments. (optional)
10.0 Perform basic computer-aided drafting functions using CAD software.
11.0 Apply three-dimensional modeling concepts using CAD software.
12.0 Design and prepare basic architectural drawings using 2D sketching and/or CAD software.
13.0 Demonstrate an understanding of basic civil drawings.
14.0 Perform computer-aided drafting functions using 3D modeling software to create an architectural model or other type of model.
15.0 Describe the importance of professional ethics and legal responsibilities in the design and construction industry.
16.0 Prepare computer-aided three-dimensional architectural drawings.
17.0 Research the history of the built environment.
18.0 Investigate sustainability issues related to the design, construction and maintenance of the built environment.
19.0 Examine career opportunities in drafting and related fields to determine requisite skills, qualifications, supply and demand, market location and potential earnings.

Florida Department of Education
Student Performance Standards

Course Title: **Drafting 1**
Course Number: **8725010**
Course Credit: **1**

Course Description:

This course provides instruction in basic drawing and drafting skills, applied mathematics, multi-view and sectional drawings.

CTE Standards and Benchmarks	
01.0	Apply basic drafting, sketching and Computer-Aided Drawing (CAD) techniques and skills. The student will be able to:
01.01	Use and maintain drafting equipment, measuring scales, drafting instruments and reproduction equipment.
01.02	Identify and use the various drafting media and techniques.
01.03	Demonstrate the use of the alphabet of lines.
01.04	Prepare title blocks and other drafting formats.
01.05	Use various freehand and other lettering techniques.
01.06	Develop skill in sketching and mark making to plan, execute and construct two-dimensional images or three-dimensional models, including presentation graphics.
01.07	Apply geometric construction techniques.
01.08	Solve geometric, algebraic and trigonometric problems related to drafting.
01.09	Demonstrate care of equipment.
01.10	Apply use of effective and accurate architectural and/or engineering vocabulary throughout design and drafting process.
02.0	Apply the design procedures. The student will be able to:
02.01	Analyze challenges and identify solutions for design problems.
02.02	Investigate the use of space, scale and environmental features to create three-dimensional form, or the illusion of depth and form.
02.03	Analyze and apply data and measurements to solve problems and interpret drawings.
03.0	Design and prepare multi-view drawings using 2D sketching and/or CAD software. The student will be able to:

CTE Standards and Benchmarks	
	03.01 Prepare multi-view scaled drawings.
	03.02 Select proper drawing scale, views and layout.
	03.03 Prepare drawings containing horizontal and vertical surfaces.
	03.04 Prepare drawings containing circles and/or arcs.
	03.05 Prepare removed details and conventional breaks.
04.0	Prepare sectional views using 2D sketching and/or CAD software. The student will be able to:
	04.01 Prepare drawings containing full sections and half sections.
	04.02 Prepare drawings containing offset sections.
	04.03 Prepare drawings containing revolved sections.
	04.04 Prepare drawings containing removed sections and broken-out sections.
	04.05 Prepare a sectional assembly drawing applying material symbols.
05.0	Prepare auxiliary drawings using 2D sketching and/or CAD software. The student will be able to:
	05.01 Prepare drawings containing primary auxiliary views.
	05.02 Prepare drawings containing auxiliary views that include curved lines.
06.0	Apply basic dimensioning and annotation using 2D sketching and/or CAD software. The student will be able to:
	06.01 Prepare drawings containing linear, angular and circular standard dimensions.
	06.02 Prepare drawings using general and local notes.
	06.03 Apply basic tolerance techniques and nominal and actual dimensions.
07.0	Prepare working drawings. The student will be able to:
	07.01 Prepare assembly drawings.
	07.02 Prepare detail drawings.
	07.03 Prepare technical drawings.

CTE Standards and Benchmarks	
	07.04 Modify drawings to include material specifications and parts list.
08.0	Prepare pictorial drawings using 2D sketching and/or CAD software. The student will be able to:
	08.01 Prepare isometric, oblique and other pictorial drawings.
	08.02 Prepare one-point and two-point perspectives.
	08.03 Prepare presentation graphics.
09.0	Prepare surface developments. (optional) The student will be able to:
	09.01 Prepare developments of prisms, cylinders, cones and pyramids.
	09.02 Prepare developments of a transition piece.
	09.03 Prepare drawings involving intersecting pieces.
10.0	Perform basic computer-aided drafting functions using CAD software. The student will be able to:
	10.01 Demonstrate organizational skills to influence the sequential process when creating drawings.
	10.02 Construct geometric figures of lines, splines, circles, arcs, etc., to represent plans and/or mechanical assemblies.
	10.03 Create and edit text using appropriate style and size to annotate drawings.
	10.04 Create and use multi-leaders.
	10.05 Use control accuracy enhancement tools for entity positioning methods such as snap and XYZ.
	10.06 Use editing commands.
	10.07 Use viewing commands to perform zooming and panning.
	10.08 Plot drawings on media using layout and scale.
	10.09 Use query commands to interrogate database for entity characteristics, distance, area and status.
	10.10 Apply standard dimensioning rules.
	10.11 Move, stretch and offset objects.
	10.12 Create a radius between objects.

CTE Standards and Benchmarks	
	10.13 Trim and extend objects.
	10.14 Break and join objects.
	10.15 Create and edit dimensions and work with dimension styles.
	10.16 Change object properties.
	10.17 Crosshatch objects.
	10.18 Apply external references.
	10.19 Isolate and hide objects.
	10.20 Use selection set methods.
	10.21 Use rectangular and polar arrays.
	10.22 Use rotation reference angles.
	10.23 Use elements of creativity and organizational principles to create visually coherent views and layouts.
	10.24 Create and manage layers or levels.
	10.25 Use page setup for plotting.
	10.26 Create, insert and edit reusable content such as symbols and blocks or cells.
	10.27 Use specific line types.
	10.28 Create fills and gradients.
	10.29 Edit hatch patterns and fills.
11.0	Apply three-dimensional modeling concepts using CAD software. The student will be able to:
	11.01 Use coordinate systems to locate objects in three-dimensional space.
	11.02 Use basic geometric shapes available in two-dimensional and three-dimensional modeling software.
	11.03 Define the parameters used for determining size, placement and orientation of a modeling object.
	11.04 Describe the Boolean modeling operations of union, subtraction and intersection.

CTE Standards and Benchmarks	
11.05	Demonstrate extrusion or sweeping techniques that transform two-dimensional objects into three-dimensional objects.
11.06	Describe the ‘revolve’ or ‘lathe’ techniques for animating a two-dimensional object and give examples of their application.
11.07	Use scale, rotate and move actions that comprise the transformation technique for animating a three-dimensional object.
11.08	Use basic viewing navigation tools such as zoom, rotate and panning.
11.09	Work with materials, techniques and processes through practice and perseverance to create desired result in two-dimensional and three-dimensional models.
11.10	Analyze challenges and identify solutions for three-dimensional design problems.
11.11	Investigate the use of space, scale and environmental features within a model to create three-dimensional form or the illusion of depth and form.
11.12	Apply materials, ideas, images and/or equipment from other content areas to generate ideas and processes for the development of three-dimensional models.
11.13	Investigate the use of various technology, software and media design to reflect creative trends in visual culture.

Florida Department of Education
Student Performance Standards

Course Title: **Drafting 2**
Course Number: **8725020**
Course Credit: **1**

Course Description:

This course provides competencies in basic architectural and civil computer-aided drafting and design, as well as an overview of the history of the built environment.

CTE Standards and Benchmarks	
12.0	Design and prepare basic architectural drawings using 2D sketching and/or CAD software. The student will be able to:
12.01	Solve design problems, through convergent and divergent thinking, to gain new perspectives.
12.02	Apply critical thinking and problem solving skills to develop creative solutions for design problems.
12.03	Draw a site plan.
12.04	Draw a floor plan.
12.05	Draw interior and exterior elevations.
12.06	Draw a roof plan.
12.07	Prepare door/window schedules.
12.08	Draw wall sections.
12.09	Draw a plumbing plan. (optional)
12.10	Draw an electrical plan.
12.11	Draw a Heating, Ventilation and Air Conditioning (HVAC) plan. (optional)
12.12	Draw a roof framing plan. (optional)
12.13	Review and revise plans throughout the design process to refine and achieve design objective.
12.14	Demonstrate flexibility and adaptability throughout the design process.

CTE Standards and Benchmarks	
	12.15 Define a basic project materials list.
	12.16 Calculate a basic project quantity take-off.
13.0	Demonstrate an understanding of basic civil drawings. The student will be able to:
	13.01 Apply use of effective and accurate civil terminology throughout the design process.
	13.02 Read and interpret civil drawings.
	13.03 Read and interpret plan and profile drawings.
	13.04 Read and interpret topographic drawings.

Florida Department of Education
Student Performance Standards

Course Title: **Drafting 3**
Course Number: **8725030**
Course Credit: **1**

Course Description:

This course provides instruction in computer-aided drafting skills, professional ethics and career and education planning.

CTE Standards and Benchmarks	
14.0	Perform computer-aided drafting functions using 3D modeling software to create an architectural model or other type of model. The student will be able to:
14.01	Draw lines, arcs, circles, etc. to represent plans and/or mechanical assemblies.
14.02	Create text styles, text justification and multi-line text.
14.03	Create and use multi-leaders.
14.04	Edit dimensions.
14.05	Work with dimension styles.
14.06	Crosshatch objects.
14.07	Apply external references.
14.08	Isolate and hide objects.
14.09	Use selection set methods.
14.10	Use rectangular and polar arrays.
14.11	Use rotation reference angles.
14.12	Use elements of creativity and organizational principles to create visually coherent views and layouts.
14.13	Create and manage layers or levels.
14.14	Use page setup for plotting.
14.15	Create, insert and edit reusable content such as symbols and blocks or cells.

CTE Standards and Benchmarks	
	14.16 Use specific line types.
	14.17 Create fills and gradients.
	14.18 Edit hatch patterns and fills.
15.0	Describe the importance of professional ethics and legal responsibilities in the design and construction industry. The student will be able to:
	15.01 Evaluate and justify decisions based on ethical reasoning.
	15.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities and employer policies.
	15.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
	15.04 Interpret and explain written organizational policies and procedures.
	15.05 Demonstrate personal responsibility, ethics and integrity, including respect for intellectual property, when accessing information and creating design projects.

Florida Department of Education
Student Performance Standards

Course Title: **Drafting 4**
Course Number: **8725040**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in three-dimensional modeling and sustainability issues related to the design, construction and maintenance of the built environment.

CTE Standards and Benchmarks	
16.0	Prepare computer-aided three-dimensional architectural drawings. The student will be able to:
16.01	Use technology to facilitate creative process and techniques.
16.02	Investigate the use of various technologies and resources to inspire creative design
16.03	Compare and analyze traditional and digital media to learn how technology has altered opportunities for innovative responses and results.
16.04	Draw plans and elevations.
16.05	Draw isometric exterior views.
16.06	Draw perspective exterior views.
17.0	Research the history of the built environment. The students will be able to:
17.01	Describe the significance of major architects, engineers or inventors to understand their historical influences.
17.02	Research innovative historical architectural and/or engineering works and examine the significance of their legacy for the future.
17.03	Identify transitions in design media, technique and focus to explain how technology has changed design throughout history.
18.0	Investigate sustainability issues related to the design, construction and maintenance of the built environment. The student will be able to:
18.01	Describe the impact of the construction industry on the natural environment.
18.02	Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.
18.03	Research and recommend sustainable design solutions.

CTE Standards and Benchmarks	
	18.04 Identify specific design practices that can lessen adverse impacts on the environment.
	18.05 Explain the environmentally sustainable features of a building.
	18.06 Invite the US Green Building Council to make a presentation. (optional)
19.0	Examine career opportunities in drafting and related fields to determine requisite skills, qualifications, supply and demand, market location and potential earnings. The student will be able to:
	19.01 Identify and demonstrate positive work behaviors needed to be employable.
	19.02 Develop and use criteria to select works for a digital career portfolio.
	19.03 Evaluate and compare employment opportunities that match career goals.
	19.04 Examine licensing, certification, education and industry credentialing requirements for careers in design and construction industry.
	19.05 Identify opportunities and research requirements for career advancement.

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.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. 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 IEP served in Exceptional Student Education (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 and regulated secondary programs 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 course or a modified course. 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 a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. 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.

Florida Department of Education
Curriculum Framework

Program Title: **Electricity**
Program Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

Secondary – Career Preparatory	
Program Number	8727200
CIP Number	0646030200
Grade Level	9-12
Program Length	8 Credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-3013 -- Helpers--Electricians 47-2111 -- Electricians
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 or advanced training in a variety of electrical construction industries.

This program focuses on broad, transferable skills, stresses the understanding of all aspects of the electricity industry, and demonstrates such elements of the industry as planning, management, finance, technical and production skills, underlying principles of technology, labor issues, community issues, and health, safety, and environmental issues.

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.

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 totaling eight credits.

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

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8727210	Electricity 1	ELECTRICAL @7 7G IND ENGR 7G TEC ED 1@2 ENG&TEC ED1@2	1 Credit	47-3013	2	CT
8727220	Electricity 2		1 Credit		2	CT
8727230	Electricity 3	ELECTRICAL @7 7G	1 Credit	47-2111	3	CT
8727240	Electricity 4		1 Credit		3	CT
8727250	Electricity 5		1 Credit		3	CT
8727260	Electricity 6		1 Credit		3	CT
8727270	Electricity 7		1 Credit		3	CT
8727280	Electricity 8		1 Credit		3	CT

(Graduation Requirement Codes: CT= Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA= Mathematics, PL= Personal Financial Literacy)

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Explain the importance of health, safety, environmental stewardship and related regulatory compliance.
02.0 Identify, use and maintain the tools and accessories used in the electrical industry.
03.0 Demonstrate an understanding of basic Direct Current (DC) electrical circuit skills.
04.0 Apply mathematics knowledge and skills to electricity.
05.0 Demonstrate an understanding of basic electricity.
06.0 Read and interpret basic electric codes.
07.0 Apply further mathematics knowledge and skills to electricity.
08.0 Demonstrate further understanding of electricity.
09.0 Demonstrate analytical and trouble shooting skills related to electrical principles.
10.0 Demonstrate proficiency in electrical math problems and skills.
11.0 Demonstrate an understanding of Alternating Current (AC) circuit skills.
12.0 Explain the importance of employability and entrepreneurship skills.
13.0 Install residential wiring.
14.0 Install residential wiring systems.
15.0 Demonstrate proficiency in commercial wiring.
16.0 Demonstrate specialized electrical skills.

Florida Department of Education
Student Performance Standards

Course Title: **Electricity 1**
Course Number: **8727210**
Course Credit: **1**

Course Description:

This course enables students to develop the essential competencies for working in the electrical industry. These competencies include safety practices, direct-current electrical-circuit skills, appropriate communication and math skills, basic electricity and electric codes.

CTE Standards and Benchmarks	
01.0	Explain the importance of health, safety, environmental stewardship and related regulatory compliance. The student will be able to:
01.01	Understand the role and purpose of the Occupational Safety and Health Administration (OSHA) rules and regulations.
01.02	Clean the work area and maintain it in a safe condition.
01.03	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.04	Identify and operate workplace safety electrical devices.
01.05	Identify health related problems that may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
01.06	Explain emergency procedures to follow in response to workplace accidents.
01.07	Create a disaster and/or emergency response plan for specific incidences.
01.08	Explain the importance of CPR (CardioPulmonary Resuscitation) and first aid.
01.09	Describe "Right-to-Understand" Law as recorded in (29 CFR.1910.1200).
02.0	Identify, use and maintain the tools and accessories used in the electrical industry. The student will be able to:
02.01	Identify and select tools, equipment and materials to complete a job.
02.02	Drill holes in metal, wood and concrete for electrical installations.
02.03	Determine the layout of electrical devices, complying with local, state and national electric code regulations.
02.04	Install the following, complying with the appropriate local, state or national electric codes: • Conductors and cable.

CTE Standards and Benchmarks	
	• Standard outlets and switch boxes. • Cord connections on equipment. • Cords, switches, receptacles and dimmers, including a single-pole switched lighting circuit, a three-way switched lighting circuit and a four-way combination circuit.
03.0	Demonstrate an understanding of basic Direct Current (DC) electrical circuit skills. The student will be able to:
03.01	Define the following terms: voltage, current, resistance and power.
03.02	Measure voltage, current and resistance using industry standard electrical measuring devices.
03.03	Analyze and explain series, parallel, and series parallel (combination) circuits.
03.04	Draw each type of circuit and calculate the circuit values.
03.05	Explain and apply Ohm's Law.
03.06	Compute conductance and resistance of conductors.
04.0	Apply mathematics knowledge and skills to electricity. The student will be able to:
04.01	Demonstrate knowledge of arithmetic operations.
04.02	Analyze and apply data and measurements to solve problems and interpret documents.
04.03	Construct charts, tables and graphs using functions and data.
05.0	Demonstrate an understanding of basic electricity. The student will be able to:
05.01	Relate electricity to the nature of matter.
05.02	Describe various ways that electricity is produced.
05.03	Explain the magnetic properties of circuits and devices.
05.04	Explain the principles of electromagnetism.
06.0	Read and interpret basic electric codes. The student will be able to:
06.01	Describe the importance of following the local, state and national electric codes.
06.02	Read and interpret basic electric codes, wiring plans and specifications.
06.03	Identify licensure requirements for electrical occupations.

CTE Standards and Benchmarks
06.04 Demonstrate knowledge of National Fire Protection Association (NFPA) 70E and how it relates to job safety.

Florida Department of Education
Student Performance Standards

Course Title: **Electricity 2**
Course Number: **8727220**
Course Credit: **1**

Course Description:

This course enables students to develop competencies related to math applications and analytical/trouble shooting skills in electricity.

CTE Standards and Benchmarks	
07.0	Apply further mathematics knowledge and skills to electricity. The student will be able to:
07.01	Demonstrate and solve basic algebraic formulas related to electricity.
07.02	Solve basic trigonometric functions related to electrical theory.
07.03	Explain basic Alternating Current (AC) theory and solve related mathematical problems using appropriate test equipment.
07.04	Solve math related problems from measurements on training aids.
08.0	Demonstrate further understanding of electricity. The student will be able to:
08.01	Explain how voltage is produced by chemical, mechanical, thermal, photoelectric and piezo electric means.
09.0	Demonstrate analytical and trouble shooting skills related to electrical principles. The student will be able to:
09.01	Identify conditions and resolutions to overcurrent and ground fault conditions in electrical circuits.
09.02	Discuss the dangers, conditions and resolutions to short circuit and arc fault conditions in electrical circuits.

Florida Department of Education
Student Performance Standards

Course Title: **Electricity 3**
Course Number: **8727230**
Course Credit: **1**

Course Description:

This course provides students with electrical math skills.

CTE Standards and Benchmarks	
10.0	Demonstrate proficiency in electrical math problems and skills. The student will be able to:
10.01	Calculate wiring costs.
10.02	Calculate voltage drop.
10.03	Determine ampacity correction factors.
10.04	Calculate conduit fill.
10.05	Calculate box fill.
10.06	Calculate range loads.

Florida Department of Education
Student Performance Standards

Course Title: **Electricity 4**
Course Number: **8727240**
Course Credit: **1**

Course Description:

This course enables students to develop the competencies needed for employment in the residential electrical industry. These competencies include employability, entrepreneurship, Alternating Current circuitry and troubleshooting residential electric circuits.

CTE Standards and Benchmarks	
11.0	Demonstrate an understanding of Alternating Current (AC) circuit skills. The student will be able to:
11.01	Identify the physical and electrical characteristics of capacitors and inductors.
11.02	Demonstrate proficiency in measuring, testing and connecting a transformer.
11.03	Analyze and apply the principles of transformers to AC circuits.
11.04	Identify the properties of an AC signal. (optional)
11.05	Identify AC sources.
12.0	Explain the importance of employability and entrepreneurship skills. The student will be able to:
12.01	Identify and demonstrate positive work behaviors needed to be employable.
12.02	Develop a personal career plan that includes goals, objectives and strategies.
12.03	Examine licensing, certification and industry credentialing requirements.
12.04	Maintain a career portfolio to document knowledge, skills and experience.
12.05	Evaluate and compare employment opportunities that match career goals.
12.06	Identify and exhibit traits for retaining employment.
12.07	Identify opportunities and describe requirements for career advancement.
12.08	Describe the benefits of ongoing professional development.

CTE Standards and Benchmarks
12.09 Examine and describe entrepreneurship opportunities as a career planning option.

Florida Department of Education
Student Performance Standards

Course Title: **Electricity 5**
Course Number: **8727250**
Course Credit: **1**

Course Description:

This course enables students to develop basic competencies in the installation of residential wiring.

CTE Standards and Benchmarks	
13.0	Install residential wiring. The student will be able to:
13.01	Identify residential wiring requirements and specifications in accordance with a wiring plan.
13.02	Identify electrical symbols in construction documents.
13.03	Draw a residential wiring plan using electrical wiring symbols.
13.04	Identify and install a recessed lighting fixture, a fluorescent lighting fixture and a surface lighting fixture according to the specifications, complying with the appropriate local, state and national electric codes.
13.05	Identify, install and wire a duplex receptacle outlet circuit, a split circuit duplex receptacle outlet circuit, and a special purpose receptacle outlet circuit, a Ground Fault Circuit Interrupter (GFCI) receptacle or circuit, and an Arc Fault Circuit Interrupter (AFCI) receptacle or circuit, according to the specifications, complying with the appropriate local, state and national electric codes.

Florida Department of Education
Student Performance Standards

Course Title: **Electricity 6**
Course Number: **8727260**
Course Credit: **1**

Course Description:

This course provides students with a more in-depth knowledge of the installation of residential wiring systems.

CTE Standards and Benchmarks	
14.0	Install residential wiring systems. The student will be able to:
14.01	Install and wire a low voltage signal system.
14.02	Install conduit systems.
14.03	Provide power for Heating, Ventilation and Air Conditioning (HVAC) equipment.
14.04	Install the following, complying with the appropriate local, state and national electric codes: • Service entrance main panel. • Service entrance meter base. • Alarm systems and smoke detectors.
14.05	Demonstrate knowledge of the requirements for the installation of a swimming pool electrical system.
14.06	Connect single-phase and three-phase transformers.
14.07	Troubleshoot residential electric circuits.

Florida Department of Education
Student Performance Standards

Course Title: **Electricity 7**
Course Number: **8727270**
Course Credit: **1**

Course Description:

This course enables students to develop competencies for commercial wiring installations.

CTE Standards and Benchmarks	
15.0	Demonstrate proficiency in commercial wiring. The student will be able to:
15.01	Read and interpret a commercial wiring plan and specifications.
15.02	Draw a commercial electrical wiring plan.
15.03	Select tools, equipment and materials to complete a job.
15.04	Install or identify the following according to the plan and specifications, complying with appropriate electric codes: • Wire mold. • Conduit, duct and raceway systems. • Conductors in a conduit.
15.05	Describe the difference between a residential and a commercial lighting circuit.
15.06	Describe poly-(three)-phase circuits.
15.07	Install a simple poly-(three)-phase circuit.
15.08	Construct control circuits from schematics.
15.09	Describe high voltage (over 1000 volts) wiring requirements.

Florida Department of Education
Student Performance Standards

Course Title: **Electricity 8**
Course Number: **8727280**
Course Credit: **1**

Course Description:

This course enables students to develop specialized skills in electricity.

CTE Standards and Benchmarks	
16.0	Demonstrate specialized electrical skills. The student will be able to:
16.01	Demonstrate an understanding of solid state control devices such as Variable Frequency Drives (VFD's), electronic ballast, electronic motor starters, motion sensors, etc.
16.02	Demonstrate an understanding of data cable installation according to the plans and specifications.
16.03	Demonstrate an understanding of the basic concepts of grounding and bonding.

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.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. 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 IEP served in Exceptional Student Education (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 and regulated secondary programs 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 course or a modified course. 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 a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. 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.

Florida Department of Education
Curriculum Framework

Program Title: **Civil Engineering Aide**
Program Type: **Career Preparatory**
Career Cluster: **Architecture & Construction**

Secondary – Career Preparatory	
Program Number	8915000
CIP Number	0715029901
Grade Level	9-12
Program Length	4 Credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3031 -- Surveying and Mapping 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 entry level employment as surveying technicians, mapping technicians, and surveyor's helpers assisting civil engineers, surveyors, urban planners or civil engineering aides.

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, drafting, model building and performing engineering tests.

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 totaling four credits.

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

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8915010	Civil Engineering Aide 1	TEC CONSTR @7 7G SURVEY 7 G	1 Credit	17-3031	2	CT
8915020	Civil Engineering Aide 2		1 Credit		2	CT
8915030	Civil Engineering Aide 3		1 Credit		3	CT
8915040	Civil Engineering Aide 4		1 Credit		3	CT

(Graduation Requirement Codes: CT= Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA= Mathematics, PL= Personal Financial Literacy)

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Demonstrate algebraic and geometric math skills using concrete and graphic models.
02.0 Assist civil engineers in collecting and analyzing soil samples.
03.0 Demonstrate the use of survey and mapping instruments to perform level surveys.
04.0 Create drawings and sketches.
05.0 Identify and understand various fields and careers in engineering.
06.0 Demonstrate the use of survey instruments to conduct boundary surveys.
07.0 Understand basic concepts of structures.
08.0 Demonstrate understanding of water and wastewater systems.
09.0 Demonstrate model building, using civil engineering principles.
10.0 Use project scheduling software.
11.0 Demonstrate beginning knowledge of grading and drainage concepts.
12.0 Assist transportation planners in obtaining information for traffic engineering.
13.0 Explain the importance of employability and entrepreneurship skills.
14.0 Describe the importance of professional ethics and legal responsibilities of the business of civil engineering.
15.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
16.0 Identify and demonstrate proper record keeping including plan revisions and management, as well as plan versus specification hierarchy.
17.0 Identify the environmental impact of a civil engineering project.
18.0 Describe the economics of civil engineering projects.
19.0 Identify the required licensing and certifications for civil engineering.

Florida Department of Education
Student Performance Standards

Course Title: **Civil Engineering Aide 1**
Course Number: **8915010**
Course Credit: **1**

Course Description:

This course focuses heavily on drawing and sketching for civil engineering and surveying. Content includes the application of algebraic and geometric mathematics skills, collecting and analyzing soil samples, conducting site surveys and exploring careers in engineering.

CTE Standards and Benchmarks	
01.0	Demonstrate algebraic and geometric math skills using concrete and graphic models. The student will be able to:
01.01	Calculate missing elements of right triangles using the Pythagorean Theorem and trigonometric functions.
01.02	Calculate volume and area of rectangles, squares, triangles, parallelograms, cylinders, cones, and spheres.
01.03	Collect, read, analyze, interpret, and report on data in graphs, charts, spreadsheets, and tables.
01.04	Measure dimensions of time, temperature, distance, capacity and mass/weight using real life models and computer simulations.
01.05	Make and apply measurements to include, but not limited to, distance, perimeter, area, volume, and force in both traditional and metric units.
01.06	Make estimates and approximations and judge the feasibility of the result.
01.07	Read and use an engineering scale.
02.0	Assist civil engineers in collecting and analyzing soil samples. The student will be able to:
02.01	Understand why soil samples are collected and tested.
02.02	Demonstrate the procedures used to prepare soil samples for testing.
02.03	Show ability to take a disturbed soil sample.
03.0	Demonstrate the use of survey and mapping instruments to perform level surveys. The student will be able to:
03.01	Define survey terms by use of structural analysis, decoding, and contextual clues or by using a dictionary.
03.02	Demonstrate knowledge and use of survey equipment.

CTE Standards and Benchmarks	
	03.03 Perform a level survey.
	03.04 Read and analyze a topographic contour map.
	03.05 Generate topographic contours from field notes.
04.0	Create drawings and sketches. The student will be able to:
	04.01 Create and understand isometric and orthographic views.
	04.02 Create hand drawn informational sketches.
	04.03 Create computer-aided drafting (CAD) drawings and understand terminology.
	04.04 Use digital equipment and peripheral devices to record, create, present, and/or share accurate visual images with others.
	04.05 Investigate the use of technology and other resources to inspire design-making decisions.
	04.06 Develop skill in sketching and mark-making to plan, execute, and construct two-dimensional images or three-dimensional models.
	04.07 Investigate the use of space, scale, and environmental features of a structure to create three-dimensional form or the illusion of depth and form.
05.0	Identify and understand various fields and careers in engineering. The student will be able to:
	05.01 Define engineering.
	05.02 Describe various fields of engineering.
	05.03 Differentiate between fields of engineering.

Florida Department of Education
Student Performance Standards

Course Title: **Civil Engineering Aide 2**
Course Number: **8915020**
Course Credit: **1**

Course Description:

This course provides instruction in boundary surveys and the basics of water and wastewater systems. Practical application of concepts is demonstrated through model building.

CTE Standards and Benchmarks	
06.0	Demonstrate the use of survey instruments to conduct boundary surveys. The student will be able to:
06.01	Perform boundary survey.
06.02	Perform boundary survey closing from field notes.
06.03	Demonstrate knowledge of survey terminology and use of survey equipment.
07.0	Understand basic concepts of structures--The student will be able to:
07.01	Identify the forces of equilibrium.
07.02	Describe how strength of material affects the overall balance of a structure.
07.03	Perform a simple structure analysis.
07.04	Understand structural engineering terminology and factors of safety.
07.05	Use critical-thinking skills for various contexts to develop, refine, and reflect on a design theme.
07.06	Analyze challenges and identify solutions for three-dimensional structural problems.
07.07	Apply the critical-thinking and problem-solving skills used in design to develop creative solutions for real-life issues.
07.08	Demonstrate flexibility and adaptability throughout the innovation process to focus and re-focus on an idea, deliberately delaying closure to promote creative risk-taking.
08.0	Demonstrate understanding of water and wastewater systems. The student will be able to:
08.01	Explain and diagram water cycle and understand basic water and wastewater terminology.

CTE Standards and Benchmarks	
	08.02 Describe drinking water sources, contaminants, wastewater disposal options, water and wastewater regulations and basic water and wastewater treatment methods.
	08.03 Understand gravity and forced systems.
09.0	Demonstrate model building, using civil engineering principles. The student will be able to:
	09.01 Develop the sense of scale.
	09.02 Participate in a model building project.
	09.03 Define and understand terminology related to models and prototypes.
	09.04 Use and maintain tools and equipment to facilitate the creative process.
	09.05 Manipulate and embellish malleable or rigid materials to construct representational or abstract forms.

Florida Department of Education
Student Performance Standards

Course Title: **Civil Engineering Aide 3**
Course Number: **8915030**
Course Credit: **1**

Course Description:

This course provides instruction in project scheduling software, grading and drainage concepts, and traffic engineering. Business skills such as employability and professional ethics related to civil engineering are included.

CTE Standards and Benchmarks	
10.0	Use project scheduling software. The student will be able to:
10.01	Apply factors such as project costs, critical path, milestones and duration to project schedules.
10.02	Prepare Gant and a Pert charts.
11.0	Demonstrate beginning knowledge of grading and drainage concepts. The student will be able to:
11.01	Demonstrate knowledge of runoff through use of terminology and correct mathematical formulas and analysis.
11.02	Recognize soil types and land cover as related to runoff.
11.03	Recognize erosion, non-point source pollution and erosion control methods.
12.0	Assist transportation planners in obtaining information for traffic engineering. The student will be able to:
12.01	Collect and interpret data for origin/destination studies.
12.02	Perform traffic counts.
12.03	Collect and interpret demographic data.
12.04	Understand traffic terminology such as peak hour and average daily trips, etc.
12.05	Understand the importance of an urban transportation plan.
13.0	Explain the importance of employability and entrepreneurship skills. The student will be able to:
13.01	Identify and demonstrate positive work behaviors needed to be employable.

CTE Standards and Benchmarks	
13.02	Develop personal career plan that includes goals, objectives, and strategies.
13.03	Examine licensing, certification, and industry credentialing requirements.
13.04	Maintain a career portfolio to document knowledge, skills, and experience.
13.05	Evaluate and compare employment opportunities, including internships, which match career goals.
13.06	Identify and exhibit traits for retaining employment.
13.07	Identify opportunities and research requirements for career advancement.
13.08	Research the benefits of ongoing professional development.
13.09	Examine and describe entrepreneurship opportunities as a career planning option.
13.10	Examine career opportunities in the visual arts to determine requisite skills, qualifications, supply-and-demand, market location, and potential earnings.
13.11	Create a body of collaborative work to show artistic cohesiveness, team-building, respectful compromise, and time-management skills.
14.0	Describe the importance of professional ethics and legal responsibilities of the business of civil engineering. The student will be able to:
14.01	Describe the role and job descriptions of civil engineering staff members.
14.02	Describe the roles and responsibilities of various entities involved in a construction project (contractor, supplier, engineer, owner, government and lending agencies).
14.03	Describe the roles of agencies and their purposes: OSHA, ASTM, ACI, AASHTO, and FDOT.
14.04	Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
14.05	Evaluate and justify decisions based on ethical reasoning.
14.06	Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.

Florida Department of Education
Student Performance Standards

Course Title: **Civil Engineering Aide 4**
Course Number: **8915040**
Course Credit: **1**

Course Description:

This course provides practical experience in the civil engineering industry. Content includes safety, recordkeeping, analyzing the environmental impact and economics of civil engineering projects, and required licensing. Civil Engineering Aide 1, 2, and 3 are prerequisites to this course.

CTE Standards and Benchmarks	
15.0	Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
15.01	Identify hazards related to civil engineering and prevention of injury.
15.02	Describe and practice safety techniques related to confined entry conditions, handling chemicals and materials, spill controls, etc.
15.03	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
15.04	Explain emergency procedures to follow in response to workplace accidents.
15.05	Use digital equipment and peripheral devices to record, create, present, and/or share accurate visual images with others.
15.06	Apply rules of convention to create purposeful design.
15.07	Use technological tools to create design.
16.0	Identify and demonstrate proper record keeping including plan revisions and management, as well as plan versus specification hierarchy. The student will be able to:
16.01	Understand documentation and record-keeping purposes and procedures.
16.02	Understand legal, environmental and public relations applications of records.
16.03	Demonstrate proper use of photographic equipment.
17.0	Identify the environmental impact of a civil engineering project. The student will be able to:
17.01	Explain the importance of sustainable design.
17.02	Explain the importance and impact of environmental regulations.

CTE Standards and Benchmarks	
	17.03 Describe the environmental permitting procedures.
	17.04 Understand how environmental rules and laws are mandated.
18.0	Describe the economics of civil engineering projects. The student will be able to:
	18.01 Understand basic economic terms.
	18.02 Understand life cycle of projects.
19.0	Identify the required licensing and certifications for civil engineering. The student will be able to:
	19.01 Identify education, experience and testing requirements.
	19.02 Understand ramifications of unlicensed engineering.
	19.03 Understand the need for continuing education.
	19.04 Discuss the education, experience and certification and/or licensure requirements of various workers of the civil engineering and related fields.
	19.05 Investigate areas of specialty in civil engineering.

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.

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English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

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SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. 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 IEP served in Exceptional Student Education (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 and regulated secondary programs 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 course or a modified course. 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 a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. 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.

Florida Department of Education
Curriculum Framework

Program Title: **Air Conditioning, Refrigeration and Heating Systems Technology**
Career Cluster: **Architecture and Construction**

AAS	
CIP Number	0615050100
Program Type	College Credit
Program Length	64 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
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 or advanced training in the heating, ventilation, air-conditioning/refrigeration (HVAC/R) industry. The student should obtain EPA certification prior to leaving school in order to be employed in any job that requires work with refrigerants. This program focuses on broad, transferable skills, stresses the understanding of the heating, air-conditioning, refrigeration and ventilation industry and demonstrates elements of the industry such as planning, management, finance, technical and production skills, the underlying principles of technology, and health, safety and environmental issues.

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 designing, testing and repairing heating, ventilation, air-conditioning/refrigeration (HVAC/R) systems.

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

Program Structure

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

Standards

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

01.0 Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
02.0 Explain the importance of employability and entrepreneurship skills.
03.0 Identify, use and maintain the tools and tool accessories used in the heating, air-conditioning and refrigeration industry.
04.0 Demonstrate mathematics knowledge and skills.
05.0 Read construction documents.
06.0 Explain the properties of matter and heat behavior.
07.0 Describe the history and concepts of heating, air-conditioning and refrigeration.
08.0 Demonstrate a practical knowledge of basic electricity and of the electrical components of heating, air-conditioning and refrigeration equipment.
09.0 Demonstrate knowledge of electrical wiring in air-conditioning and refrigeration.
10.0 Troubleshoot heating, air-conditioning and refrigeration electrical control systems and their components.
11.0 Select and test electrical generation and distribution components for commercial heating and air conditioning systems.
12.0 Analyze fluids, pressures, refrigerants and related codes.
13.0 Evaluate heating, air-conditioning and refrigeration system components and accessories.
14.0 Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
15.0 Maintain, test and troubleshoot electrical motors and their components for commercial heating and air-conditioning systems.
16.0 Utilize mechanical components of heating air-conditioning and refrigeration systems.
17.0 Operate solid-state electronics as used in heating, air-conditioning and refrigeration systems.
18.0 Utilize and operate mechanical refrigeration servicing and testing equipment.
19.0 Assist in the installation of a residential heating and air-conditioning system and determine start-up procedures.
20.0 Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems.
21.0 Use combustion-type heating servicing and testing equipment.
22.0 Troubleshoot combustion gas valves and regulators as used in heating, air-conditioning, refrigeration and ventilation systems.
23.0 Understand the design of heating and cooling systems.
24.0 Make career plans.
25.0 Select appropriate commercial compressors.
26.0 Test and adjust commercial evaporative condensers.
27.0 Maintain, test and troubleshoot commercial evaporators.
28.0 Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing.
29.0 Maintain, troubleshoot and repair commercial heating systems.
30.0 Discuss new technologies.
31.0 Develop an understanding of hydronic systems.
32.0 Determine the properties of air.
33.0 Use a pressure enthalpy chart to diagram refrigerant cycles.
34.0 Explain the standards for and ways to measure indoor-air quality.

35.0 (Optional) Identify and understand pneumatic control systems for commercial heating and air-conditioning applications.
36.0 Develop an understanding of chilled systems.
37.0 (Optional) Maintain and repair thermal storage systems.
38.0 Interpret, use and modify construction drawings and specifications.
39.0 Troubleshoot and repair commercial heating and air-conditioning systems.
40.0 Understand and explain the calculation of commercial heating and air-conditioning loads.
41.0 Balance an air distribution system.
42.0 Select energy conservation equipment.
43.0 Analyze building management systems.
44.0 (Optional) Recommend alternative heating and cooling systems for various case studies.
45.0 Demonstrate knowledge of retail refrigeration systems.
46.0 Demonstrate knowledge of commercial and industrial refrigeration systems.
47.0 Demonstrate a working knowledge of electrical generation and distribution components for commercial heating and air conditioning systems.
48.0 Demonstrate a working knowledge of refrigeration-system vibration and insulation.
49.0 Apply commercial refrigeration-pipe sizing and troubleshooting procedures.
50.0 Use refrigeration-systems skills in commercial applications.
51.0 Demonstrate a working knowledge of refrigerated storage systems.
52.0 Diagnose, maintain and repair ice-making systems.
53.0 Use refrigeration electrical-system skills in commercial applications.
54.0 Maintain and troubleshoot commercial refrigeration systems.

Florida Department of Education
Student Performance Standards

Program Title: **Air Conditioning, Refrigeration and Heating Systems Technology**
CIP Number: **0615050100**
Program Length: **64 Credit Hours**

At the completion of this program, the student will be able to:	
01.0	Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
01.01	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.02	Explain the reasons for regular safety meetings and for company safety policies.
01.03	Explain the need for employee-background checks and medical examinations.
01.04	Identify appropriate fire extinguishers and other such safety devices.
01.05	Identify and follow emergency and rescue procedures.
01.06	Identify and use safe-handling practices as they relate to hazardous and volatile fluids, compounds and gases.
01.07	Demonstrate Occupational Safety and Health Administration (OSHA) 10, Environmental Protection Agency (EPA) practices, Department of Transportation (DOT) hazardous materials safety requirements, lock-out and tag out, and electrical safety.
01.08	Select and wear proper protective clothing and equipment.
01.09	Describe the purpose and requirements of local, state and federal heating, air-conditioning and refrigeration codes and standards as well as the manufacturer's installation instructions.
01.10	Identify and use OSHA practices when working with heating, air-conditioning and refrigeration systems and equipment.
01.11	Explain emergency procedures to follow in response to workplace accidents and understand a disaster and/or emergency response plan.
02.0	Explain the importance of employability and entrepreneurship skills. The student will be able to:
02.01	Identify and demonstrate positive work behaviors needed to be employable.
02.02	Develop personal career plan that includes goals, objectives and strategies.
02.03	Create and maintain a career portfolio to document knowledge, skills and experience.
03.0	Identify, use and maintain the tools and tool accessories used in the heating, air-conditioning and refrigeration industry. The student will be able to:

	03.01 Follow safety precautions when using hand and power tools.
	03.02 Identify and use basic hand tools and tool accessories; power tools (electric and mechanical); pipe and tube-working tools; and specialized tools of the trade.
	03.03 Apply appropriate care and maintenance procedures for tools and tool accessories, following the directions in the tool-equipment manufacturer's manual.
04.0	Demonstrate mathematics knowledge and skills. The student will be able to:
	04.01 Demonstrate knowledge of arithmetic operations.
	04.02 Analyze and apply data and measurements to solve problems and interpret documents.
05.0	Read construction documents. The student will be able to:
	05.01 Recognize and identify basic construction drawing terms, components and symbols.
	05.02 Relate information on construction drawings to actual locations on the print.
	05.03 Recognize different classifications of construction drawings.
	05.04 Interpret and use drawing dimensions.
06.0	Explain the properties of matter and heat behavior. The student will be able to:
	06.01 Describe and explain freezing point, critical temperature and absolute zero.
	06.02 Explain the gas laws (Dalton, Boyle and Charles) used when dealing with air and its properties.
	06.03 Describe matter, heat and heat transfer.
	06.04 Differentiate between heat and temperature.
	06.05 Explain and distinguish among the characteristics of the three states of matter.
	06.06 Explain the relationship between temperature and humidity.
	06.07 Differentiate between latent heat and sensible heat.
07.0	Describe the history and concepts of heating, air-conditioning and refrigeration. The student will be able to:
	07.01 Explain the basic principles of heating, ventilation and air-conditioning.
	07.02 Identify the refrigeration cycle.

	07.03 Identify and explain the four major refrigeration components.
	07.04 Identify and explain the characteristics of a compression-cycle refrigerant system.
	07.05 Differentiate between air-conditioning and refrigeration.
	07.06 Differentiate between split systems, mini-splits and package systems.
	07.07 Describe the benefits of conditioned air and indoor air quality.
	07.08 Identify various professional organizations, associations and societies and explain their purposes.
	07.09 Identify and explain the difference between a straight cool system and a heat pump.
08.0	Demonstrate a practical knowledge of basic electricity and of the electrical components of heating, air-conditioning and refrigeration equipment. The student will be able to:
	08.01 Explain the principles of electricity.
	08.02 Explain single- and three-phase power distribution.
	08.03 Define and explain watts, ohms, volts and amps.
	08.04 Identify and explain electrical measuring tools and devices.
	08.05 Explain the standards for and ways to measure watts, resistance, voltage and amperage, using appropriate instruments or devices.
09.0	Demonstrate knowledge of electrical wiring in air-conditioning and refrigeration. The student will be able to:
	09.01 Identify and explain appropriate electrical wiring symbols.
	09.02 Draw and explain a wiring schematic diagram for a control system.
	09.03 Create a wiring schematic for an air conditioner an electric furnace, a heat pump, an oil furnace (optional) and a gas furnace.
10.0	Troubleshoot heating, air-conditioning and refrigeration electrical control systems and their components. The student will be able to:
	10.01 Identify and explain the operations of electrical control systems and their components (zone damper motors, duel fuel lock out controls, outdoor thermostats/low ambient controls, defrost controls/timers and auxiliary heating controls, contactors, relays, circuit boards, motors, solenoids, and thermostats.).
	10.02 Troubleshoot protection devices, such as fuses and breakers.
	10.03 Identify, install and troubleshoot controls for heating, air-conditioning and refrigeration systems.
	10.04 Explain the operation of different types of electromechanical communicating, humidity control, and Wi-Fi and programmable operating thermostats.

	10.05 Troubleshoot operational problems for different types of electromechanical communicating, humidity control, and Wi-Fi operating thermostats.
11.0	Select and test electrical generation and distribution components for commercial heating and air conditioning systems. The student will be able to:
	11.01 Determine wire sizes, voltage drops and amperage capacity.
	11.02 Describe the operation of various types of transformers.
12.0	Analyze fluids, pressures, refrigerants and related codes. The student will be able to:
	12.01 Identify and explain general safety issues and EPA rules (especially EPA 608) and regulations regarding the handling of refrigerants.
	12.02 Define and explain pressure, fluid and temperature.
	12.03 Explain the standards for and ways to measure and calculate absolute and gauge pressures.
	12.04 Identify and explain the classifications, properties and uses of different refrigerants based on chemical composition.
	12.05 Explain how fluids react and flow in a closed versus an open environment or vessel.
	12.06 Define and identify "color-coding" of refrigerant cylinders.
	12.07 Explain the proper methods of transferring, storing and recovering refrigerants.
	12.08 Explain the effects of an improper refrigerant and contaminants in a system.
	12.09 Identify the refrigerants in common use and state the types of applications in which each is used.
	12.10 Describe how azeotropes and near-azeotropes differ from each other and from so-called pure refrigerants.
	12.11 Compare and interpret a P-T chart for pure refrigerants, azeotrope, and near-azeotrope refrigerants and explain the difference between bubble point and dew point.
	12.12 Demonstrate refrigerant leak detecting methods.
	12.13 Identify the different types of oils used in refrigeration systems and explain their relationships to the various refrigerants.
	12.14 Explain how to add and remove oil from a system.
	12.15 Describe how to test oil and acid for contamination.
	12.16 Explain and differentiate HFO refrigerants from CFC, HCFC and HFC refrigerants.
	12.17 Explain the proper procedures in handling HFO refrigerants.

13.0	Evaluate heating, air-conditioning and refrigeration system components and accessories. The student will be able to:
13.01	Explain the types, operation, use and requirements of
	• Compressors (such as reciprocating, rotary, screw, scroll and inverter)
	• Condensers and evaporators (such as evaporative condensers, evaporative coils, shell and tube, tube within a tube and fin and tube)
	• Metering devices (such as adjusting automatic and thermostatic expansion valves, fixed orifices, stepper motor electronic expansion valve (EEV), solenoid EEV and other devices available on the local market)
13.02	Identify the location and explain the uses of refrigerant flow accessories.
13.03	Identify the location and explain the uses of heating, air-conditioning and refrigeration-system accessories (such as receivers, dryers/filers, solenoid valves, heat exchangers, accumulators, suction filter, oil separators, evaporator pressure-regulating valve, crankcase pressure-regulating valves, hot gas bypass valves and check valves).
14.0	Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry. The student will be able to:
14.01	Identify and explain the purpose of the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
14.02	Bend tubing, using tube benders.
14.03	Connect tubing using flared fittings, pressed fittings and compression fittings.
14.04	Connect tubing, using a swaged-joint connection.
14.05	Identify and use various types of torches.
14.06	Identify, select and use appropriate brazing alloys, materials and skills.
14.07	Explain the purposes and procedures for protecting piping materials and fabrication, such as valves, fittings and products from heat.
14.08	Braze tubing while purging dry nitrogen.
14.09	Silver-braze brass, steels and copper.
14.10	Demonstrate an understanding of the procedures for installing pipe and tubing insulation.
14.11	Explain the procedures required for installing heating, air-conditioning, refrigerant and ventilation accessories.
14.12	Fabricate and leak-test the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
14.13	Demonstrate proper safety measures when fabricating and servicing piping, tubing and fittings.

	14.14 Describe and demonstrate procedures for brazing dissimilar metals.
15.0	Maintain, test and troubleshoot electrical motors and their components for commercial heating and air-conditioning systems. The student will be able to:
	15.01 Explain how alternating current is developed and draw a sine wave.
	15.02 Identify single-phase and three-phase wiring arrangements.
	15.03 Explain how phase shift occurs in inductors and capacitors.
	15.04 Describe the types of capacitors and their applications.
	15.05 Explain the operation of single-phase and three-phase induction motors.
	15.06 Identify and explain the operations and applications of various types of electrical motors and their components as used in heating and air-conditioning systems.
	15.07 Maintain, test and troubleshoot various types of electrical motors and their components as used in heating and air-conditioning systems.
	15.08 Demonstrate the proper use of motor testing equipment.
	15.09 Reverse the rotation of a motor.
16.0	Utilize mechanical components of heating air-conditioning and refrigeration systems. The student will be able to:
	16.01 Evaluate metering-device performance.
	16.02 Explain the methods of compression, lubrication and compressor modulation.
	16.03 Analyze the operating condition of a compressor.
	16.04 Test, troubleshoot and correct the causes of mechanical problems in a heating, air-conditioning and refrigeration system.
	16.05 Evaluate system performance.
17.0	Operate solid-state electronics as used in heating, air-conditioning and refrigeration systems. The student will be able to:
	17.01 Explain the basic principles and functions of Direct Digital Control (DDC).
	17.02 Explain basic solid-state circuits and boards.
	17.03 Identify, test and replace circuits and boards.
	17.04 Explain codes and standards and safety requirements for working with the electrical components used in heating, air conditioning and refrigeration.

18.0	Utilize and operate mechanical refrigeration servicing and testing equipment. The student will be able to:
18.01	Identify and explain the functions of servicing and testing equipment (such as vacuum pumps, micron gauges, EPA-approved equipment, leak detectors and charging systems).
18.02	Operate a refrigerant recovery system.
18.03	Apply specific safety and recovery practices for refrigerants used in the industry.
18.04	Apply specific safety practices as they relate to handling and storing cylinders and materials.
18.05	Explain the standards for and ways to measure, test, maintain and evacuate a mechanical heating, air-conditioning and refrigeration system.
18.06	Evacuate the refrigerant system with various vacuum methods.
18.07	Demonstrate compliance with Environmental Protection Agency (EPA) rules and regulations and take the EPA test.
18.08	Charge various air-conditioning and mechanical refrigeration systems by various methods.
18.09	Demonstrate the effects of superheat and sub-cooling on a system utilizing test equipment (such as thermometers and gages).
19.0	Assist in the installation of a residential heating and air-conditioning system and determine start-up procedures. The student will be able to:
19.01	Read and comply with dispatch orders.
19.02	Explain codes and ordinances.
19.03	Assist in the installation of a heating and air-conditioning system to the manufacturer's installation and operation specifications, using a practical knowledge of duct fabrication methods.
19.04	Determine which charging method is appropriate for a given type of system in a residential air-conditioning unit and adjust superheat and/or sub-cooling.
19.05	Determine the temperature split/ difference across the evaporator.
19.06	Determine the temperature split/ difference across the condenser.
19.07	Explain the electrical and mechanical operations of the basic heat pump.
19.08	Write a service report.
19.09	Apply good customer-relations skills.
20.0	Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems. The student will be able to:
20.01	Identify and explain the following heat-pump systems: air-to-air, water-to-air, water-to-water, air-to-ground (geothermal), open-loop and closed-loop.

	20.02 Determine the start-up and checkout procedures recommended by different manufacturers.
	20.03 Determine the temperature split/difference across the outdoor coil on a heat pump.
	20.04 Determine the temperature split/difference across the indoor coil on a heat pump.
	20.05 Apply good customer-relations skills.
21.0	Use combustion-type heating servicing and testing equipment. The student will be able to:
	21.01 Explain combustion theory and the safety precautions for using combustion-type-heating servicing and testing equipment.
	21.02 Identify and explain the various types of combustion-type heating servicing and testing equipment (such as draft gauge, U-tube manometer, sling psychrometer, millivolt meter and oil-furnace testing equipment).
	21.03 Use the servicing and testing equipment.
	21.04 Test, analyze and troubleshoot combustion-type-heating systems.
22.0	Troubleshoot combustion gas valves and regulators as used in heating, air-conditioning, refrigeration and ventilation systems. The student will be able to:
	22.01 Identify and discuss the safety and regulation issues and concerns.
	22.02 Explain the operations of various types of gas valves and regulators (such as low-voltage, line-voltage, pneumatic (optional), solenoid and gas and pressure regulators).
	22.03 Identify various types of gas valves and regulators.
	22.04 Determine the application of gas valves and regulators.
	22.05 Troubleshoot gas valves and regulators.
23.0	Understand the design of heating and cooling systems. The student will be able to:
	23.01 Identify and describe the steps in the system design process.
	23.02 Use construction drawings or an actual job site to obtain information needed to complete heating and cooling load estimates.
	23.03 Identify the factors that affect heat gains and losses to a building and describe how these factors influence the design process.
	23.04 Complete a load estimate to determine the heating and/or cooling load of a building.
	23.05 State the principles that affect the selection of equipment to satisfy the calculated heating and/or cooling load.
	23.06 Select heating and/or cooling equipment using manufacturers' product data.

	23.07 Identify the various types of duct systems and explain why and where each type is used.
	23.08 Demonstrate the effect of fittings and transitions on duct system design.
	23.09 Use a friction loss chart and duct sizing table to size duct.
	23.10 Install insulation and vapor barriers used in duct systems.
	23.11 Select and install refrigerant and condensate piping following proper design principles.
	23.12 Describe airflow and pressures in a basic forced-air distribution system.
	23.13 Explain the differences between propeller and centrifugal fans and blowers.
	23.14 Identify the various types of duct systems and explain why and where each type is used.
	23.15 Demonstrate or explain the installation of metal, fiberboard and flexible duct.
	23.16 Demonstrate or explain the installation of fittings and transitions used in duct systems.
	23.17 Identify and explain the operations of electrical control systems and their components (zone damper motors).
	23.18 Demonstrate or explain the use and installation of dampers used in duct systems.
	23.19 Demonstrate or explain the use and installation of insulation and vapor barriers used in duct systems.
	23.20 Identify instruments used to make measurements in air systems and explain the use of each instrument.
	23.21 Make basic temperature, air pressure and velocity measurements in an air distribution system.
	23.22 Complete a Manual D Duct design according to heat load calculations.
24.0	Make career plans. The student will be able to:
	24.01 Evaluate and compare employment opportunities that match career goals.
	24.02 Identify and exhibit traits for retaining employment.
	24.03 Identify opportunities and research requirements for career advancement.
	24.04 Research the benefits of ongoing professional development.
	24.05 Examine licensing, certification and industry credentialing requirements.
25.0	Select appropriate commercial compressors. The student will be able to:

	25.01 Compare commercial-compressor requirements with those for residential and light commercial heating and air-conditioning systems.
	25.02 Discuss appropriate commercial compressors for cooling requirements.
	25.03 Describe the mechanical operation for each type of compressor.
	25.04 Explain compressor lubrication methods.
	25.05 Explain methods used to control compressor capacity.
	25.06 Describe how compressor protection devices operate.
	25.07 Perform the common procedures used when field servicing open and semi-hermetic compressors.
26.0	Test and adjust commercial evaporative condensers. The student will be able to:
	26.01 Determine the proper air and fluid flow for commercial evaporative condensers.
	26.02 Test and adjust the airflow for proper temperature difference.
	26.03 Test and adjust the water flow for proper GPM and temperature difference.
	26.04 Check for proper water treatment.
27.0	Maintain, test and troubleshoot commercial evaporators. The student will be able to:
	27.01 Determine the operational requirements for evaporators used in commercial heating and air-conditioning applications.
	27.02 Discuss appropriate evaporators for commercial heating and air-conditioning systems
	27.03 Maintain, test and adjust commercial heating and air-conditioning accessories.
	27.04 Select the heating and air-conditioning accessories appropriate for various commercial applications.
28.0	Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing. The student will be able to:
	28.01 Identify and explain various types of heating, air-conditioning and refrigeration piping.
	28.02 Identify basic principles of sizing various heating, air conditioning, refrigeration and ventilation for various tasks.
	28.03 Explain pressure and temperature drops.
29.0	Maintain, troubleshoot and repair commercial heating systems. The student will be able to:
	29.01 Identify the components of various commercial heating systems.

	29.02 Explain the operational principles of various commercial heating systems.
	29.03 Test and analyze heating air-distribution systems.
	29.04 Maintain, troubleshoot and repair various commercial heating systems.
30.0	Discuss new technologies. The student will be able to:
	30.01 Follow safety precautions.
	30.02 Describe new technologies in heating, air-conditioning and refrigeration installation, including variable-speed motors, heat-pipe systems, desiccant systems and gas-driven heating systems.
	30.03 Describe multi-ports and variable refrigerant volume (VRV)/variable refrigerant flow (VRF) systems.
	30.04 Explain how to lay out, construct and troubleshoot comfort systems.
	30.05 Test and analyze systems.
	30.06 Test and analyze heat-recovery systems and variable refrigerant volume (VRV)/variable refrigerant flow (VRF).
31.0	Develop an understanding of hydronic systems. The student will be able to:
	31.01 Explain the terms and concepts used when working with hot-water heating systems.
	31.02 Identify the major components of hot-water heating systems.
	31.03 Explain the purpose of each component of hot-water heating systems.
	31.04 Describe the safety precautions used when working with hot water systems.
	31.05 Identify the common piping configurations used with hot water heating systems.
	31.06 Explain the principles involved and describe the procedures used in balancing hydronic systems.
	31.07 Select, calibrate and properly use the tools and instruments needed to balance hydronic systems.
	31.08 Read the pressure across a water system circulating pump.
32.0	Determine the properties of air. The student will be able to:
	32.01 Explain the principles of psychrometrics.
	32.02 Identify and explain the components and uses of a psychrometric meter.
	32.03 Identify indoor-air-quality concerns as related to psychrometrics.

	32.04 Determine the properties of air, using a psychrometric chart.
	32.05 Follow safety precautions.
	32.06 Identify and explain the different types and benefits of air-filtration systems, products for improving indoor-air quality.
	32.07 Fabricate, operate, maintain and troubleshoot air-filtration systems, air-handling systems and ventilation systems.
	32.08 Explain the functions of a Fresh Air Ventilation (FAV) system.
33.0	Use a pressure enthalpy chart to diagram refrigerant cycles. The student will be able to:
	33.01 Identify all components of the pressure enthalpy chart.
	33.02 Define enthalpy and entropy.
34.0	Explain the standards for and ways to measure indoor-air quality. The student will be able to:
	34.01 Identify and explain the codes and standards regarding indoor-air quality.
	34.02 Select and use indoor-air-quality measuring devices.
	34.03 Explain the standards for and ways to measure indoor-air quality using various methods.
35.0	(Optional) Identify and understand pneumatic control systems for commercial heating and air-conditioning applications. The student will be able to:
	35.01 Identify pneumatic control systems and explain the transition to electro/pneumatic systems.
	35.02 Understand the functions of direct acting and reverse acting controls of pneumatic control systems.
36.0	Develop an understanding of chilled systems. The student will be able to:
	36.01 Explain the terms and concepts used when working with chilled-water cooling systems.
	36.02 Identify the major components of chilled-water cooling and dual-temperature water systems.
	36.03 Explain the purpose of each component of chilled-water cooling and dual-temperature water systems.
	36.04 Describe the safety precautions used when working with chilled-water systems.
	36.05 Explain the differences between reciprocating, rotary screw, scroll and centrifugal chillers.
37.0	(Optional) Maintain and repair thermal storage systems. The student will be able to:
	37.01 Apply appropriate codes, standards and safety practices.

	37.02 Describe the benefits and limitations of each type.
	37.03 Explain the operational principles of a thermal storage system.
	37.04 Identify and explain various types of thermal storage systems.
	37.05 Troubleshoot and test various types of thermal storage systems.
38.0	Interpret, use and modify construction drawings and specifications. The student will be able to:
	38.01 Read mechanical plans within a set of construction drawings explain their relationship.
	38.02 Compare mechanical plans with the actual installation of duct and pipe runs, fittings and sections.
	38.03 Interpret specification documents and apply them to the plans.
	38.04 Interpret shop drawings and apply them to the plans and specifications.
	38.05 Develop a field set of as-built drawings.
	38.06 Identify the steps required for transferring design information to component production.
	38.07 List and classify materials most commonly used in HVAC systems.
39.0	Troubleshoot and repair commercial heating and air-conditioning systems. The student will be able to:
	39.01 Keep a record of the installation, maintenance and repair of commercial heating and air-conditioning systems.
	39.02 Apply local and national codes and safety practices.
	39.03 Lay out a commercial heating and air-conditioning system.
	39.04 Lay out a typical split commercial air-conditioning system.
	39.05 Lay out a typical split commercial heating system.
	39.06 Maintain, test, analyze and repair various types of commercial heating and air-conditioning systems.
	39.07 Maintain, troubleshoot and repair water-cooled condensers
40.0	Understand and explain the calculation of commercial heating and air-conditioning loads. The student will be able to:
	40.01 Explain conduction as a heat-load source.
	40.02 Describe the implications of conducting and the resistance values for different types of construction materials.

	40.03 Interpret heat-transfer tables and define values U, K, C and R.
	40.04 Locate the total heat-transfer value of any surface.
	40.05 Explain infiltration and exfiltration/ventilation as a heat-load source.
	40.06 Explain a product heat-load source.
	40.07 Explain miscellaneous loads (people, motors and equipment) as heat-load sources.
	40.08 Explain the purpose of vapor barriers.
	40.09 Interpret tables of specific heat values as applied to commercial heating and air-conditioning systems.
	40.10 Understand the importance of system design and load calculation process of heating and cooling systems.
	40.11 Understand and explain the methods of installing air-movement systems.
41.0	Balance an air distribution system. The student will be able to:
	41.01 Explain the fan and pump laws.
	41.02 Use a psychrometric chart to evaluate air properties and changes in air properties.
	41.03 Explain the principles involved in the balancing of air and water distribution systems.
	41.04 Define common terms used by manufacturers when describing grilles, registers and diffusers.
	41.05 Identify and use the tools and instruments needed to balance air distribution systems.
	41.06 Change the speed of an air distribution system supply fan.
42.0	Select energy conservation equipment. The student will be able to:
	42.01 Identify and explain the operation of energy conservation equipment.
	42.02 Operate selected energy conservation equipment.
43.0	Analyze building management systems. The student will be able to:
	43.01 Identify the major components of a building management system and describe how they fit together.
	43.02 Explain a basic direct digital controller.
44.0	(Optional) Recommend alternative heating and cooling systems for various case studies. The student will be able to:

	44.01 Describe alternative technologies for heating such as in-floor, direct-fired makeup unit (DFMU), solar, air turnover, corn or wood pellet burners, waste oil/multi-fuel and fireplace inserts.
	44.02 Describe alternative technologies for heating and cooling such as ductless systems, computer rooms, chilled beams and multi-zone.
45.0	Demonstrate knowledge of retail refrigeration systems. The student will be able to:
	45.01 Describe the mechanical refrigeration cycle as it applies to retail refrigeration systems.
	45.02 Explain the differences in refrigerants and applications in low-, medium- and high-temperature refrigeration systems.
	45.03 Identify and describe the primary refrigeration cycle components used in retail refrigeration systems.
	45.04 Identify and describe the supporting components and accessories used in retail refrigeration systems.
	45.05 Describe the various methods of defrost used in retail refrigeration systems.
	45.06 Identify and describe the applications for the various types of retail refrigeration systems.
	45.07 Describe the control system components used in retail refrigeration systems.
	45.08 Explain the operating sequence of a retail refrigeration system.
	45.09 Interpret wiring diagrams and troubleshooting charts to isolate malfunctions in retail refrigeration systems.
46.0	Demonstrate knowledge of commercial and industrial refrigeration systems. The student will be able to:
	46.01 Identify different types of refrigerated coolers and display cases and describe each one's common application.
	46.02 Compare and understand the basic components used in commercial/industrial refrigeration systems with those used in retail refrigeration systems.
	46.03 Identify single, multiple and satellite compressor systems; describe the applications, installation considerations and advantages and disadvantages of each type.
	46.04 Identify packaged condensing units and unit coolers; describe their applications, operation and installation considerations.
	46.05 Identify two-stage and inverter compressors and explain their operation and applications.
	46.06 Identify the various accessories used in commercial refrigeration systems and explain why each is used and where it should be installed in the system.
	46.07 Identify the various refrigeration control devices and explain the purpose of each type and how it works.
47.0	Demonstrate a working knowledge of electrical generation and distribution components for commercial heating and air conditioning systems. The student will be able to:
	47.01 Calculate loads and design and lay out a commercial refrigeration system.

	47.02 Identify and explain commercial refrigeration-pressure-regulation devices, controls and components.
	47.03 Test and troubleshoot refrigerant-pressure-regulating devices, controls and components.
	47.04 Apply local and national codes and mechanical safety practices.
48.0	Demonstrate a working knowledge of refrigeration-system vibration and insulation. The student will be able to:
	48.01 Describe the applications of vibration eliminators.
	48.02 Identify and select the correct insulation for commercial application.
49.0	Apply commercial refrigeration-pipe sizing and troubleshooting procedures. The student will be able to:
	49.01 Determine the capacities of refrigerant lines, including the amounts they will hold, equivalent lengths of fittings and the total effective length for various pipelines.
	49.02 Identify and apply industry-approved installation procedures.
	49.03 Troubleshoot refrigeration-pipe-sizing problems.
	• Explain the use of traps in suction-line risers.
	• Explain pressure drop.
	• Calculate pressure drop in liquid-line risers.
	• Size double risers, hot-gas lines and liquid lines from condenser to receiver.
50.0	Use refrigeration-systems skills in commercial applications. The student will be able to:
	50.01 Identify and apply the safety practices used with commercial refrigeration systems.
	50.02 Apply refrigeration-systems skills to commercial refrigeration systems.
	• Perform dehydration, evacuation and recovery procedures.
	• Interpret blueprints and mechanical drawings.
	• Service and charge a refrigeration system.
	• Test, analyze and replace compressors.
	• Retrofit alternative refrigerants and oils.
51.0	Demonstrate a working knowledge of refrigerated storage systems. The student will be able to:

	51.01 Identify and differentiate among various types of cases, such as service cases and self-service cases.
	51.02 Explain the operation of air-screen freezers, glass-door freezers, coffin cases and walk-in coolers.
	51.03 Differentiate among medium-temperature, low-temperature and ultralow-temperature systems.
	51.04 Explain various defrost methods.
	51.05 Maintain, test and troubleshoot defrost components.
	51.06 Identify and explain the components of various refrigerated storage systems.
	51.07 Maintain, test and troubleshoot various refrigerated storage system components.
52.0	Diagnose, maintain and repair ice-making systems. The student will be able to:
	52.01 Identify and explain various types and operations of ice-making systems.
	52.02 Maintain, test, troubleshoot and repair various types of ice-making systems, following the manufacturers' recommendations.
	52.03 Identify and explain the different types of water-treatment methods and systems.
	52.04 Analyze water to identify water problems and the proper treatments.
	52.05 Install, service and repair ice machines and specialty refrigeration systems.
	52.06 Explain and demonstrate proper procedures in sanitizing ice machines and ice storage bins.
53.0	Use refrigeration electrical-system skills in commercial applications. The student will be able to:
	53.01 Apply electrical safety practices for commercial refrigeration systems.
	53.02 Apply refrigeration electrical-system skills to commercial refrigeration systems:
	• Interpret symbols of electrical components and diagrams.
	• Interpret schematics and diagrams.
	• Apply electrical theory and calculations.
	• Explain the principles of designing electrical systems.
	• Test and troubleshoot single- and three-phase motors and variable speed electronic commutated motors (ECM).
	53.03 Test the solid-state components used in commercial refrigeration systems.

	53.04 Troubleshoot and diagnose the electrical circuits used in commercial refrigeration systems.
	53.05 Test and troubleshoot the thermostatic controls used in commercial refrigeration systems.
54.0	Maintain and troubleshoot commercial refrigeration systems. The student will be able to:
	54.01 Follow appropriate safety precautions for commercial refrigeration systems.
	54.02 Identify and explain the operations of various types of commercial refrigeration systems and applications, such as single, multiplex and cascade systems.
	54.03 Maintain and troubleshoot various types of commercial refrigeration systems.

Additional Information

Laboratory Activities

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

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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 as identified on the secondary student's Individual Educational Plan (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 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 AAS degree program includes the following College Credit Certificates (CCC):

Residential Air Conditioning, Refrigeration, and Heating Systems Assistant (0615050101) - 12 Credit Hours
Residential Air Conditioning, Refrigeration, and Heating Systems Technician (0615050102) - 24 Credit Hours

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

Florida Department of Education
Curriculum Framework

Program Title: **Residential Air Conditioning, Refrigeration & Heating Systems Assistant**
Career Cluster: **Architecture and Construction**

CCC	
CIP Number	0615050101
Program Type	College Credit Certificate (CCC)
Program Length	12 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
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 air conditioning and heating technicians or to provide supplemental training for persons previously or currently employed in these occupations.

This certificate program is part of the Air Conditioning, Refrigeration, and Heating Systems Technology AAS degree program (0615050100).

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

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 communication skills, leadership skills, human relations and employability skills, and safe and efficient work practices. The program prepares students to assist in engineering departments or work independently, capable of designing, installing, maintaining and operating small or medium air conditioning, heating or refrigerating systems.

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

Standards

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

01.0 Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
02.0 Read construction documents.
03.0 Explain the properties of matter and heat behavior.
04.0 Describe the history and concepts of heating, air-conditioning and refrigeration.
05.0 Analyze fluids, pressures, refrigerants and related codes.
06.0 Evaluate heating, air-conditioning and refrigeration system components and accessories.
07.0 Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
08.0 Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems.
09.0 Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing.
10.0 Interpret, use and modify construction drawings and specifications.
11.0 Balance an air distribution system.

Florida Department of Education
Student Performance Standards

Program Title: **Residential Air Conditioning, Refrigeration & Heating Systems Assistant**
CIP Number: **0615050101**
Program Length: **12 Credit Hours**

This certificate program is part of the Air Conditioning, Refrigeration and Heating Systems Technology AAS degree program (0615050100). At the completion of this program, the student will be able to:	
01.0	Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
01.01	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.02	Explain the reasons for regular safety meetings and for company safety policies.
01.03	Explain the need for employee-background checks and medical examinations.
01.04	Identify appropriate fire extinguishers and other such safety devices.
01.05	Identify and follow emergency and rescue procedures.
01.06	Identify and use safe-handling practices as they relate to hazardous and volatile fluids, compounds and gases.
01.07	Demonstrate Occupational Safety and Health Administration (OSHA) 10, Environmental Protection Agency (EPA) practices, Department of Transportation (DOT) hazardous materials safety requirements, lock-out and tag out, and electrical safety.
01.08	Select and wear proper protective clothing and equipment.
01.09	Describe the purpose and requirements of local, state and federal heating, air-conditioning and refrigeration codes and standards as well as the manufacturer's installation instructions.
01.10	Identify and use OSHA practices when working with heating, air-conditioning and refrigeration systems and equipment.
01.11	Explain emergency procedures to follow in response to workplace accidents and understand a disaster and/or emergency response plan.
02.0	Read construction documents. The student will be able to:
02.01	Recognize and identify basic construction drawing terms, components and symbols.
02.02	Relate information on construction drawings to actual locations on the print.
02.03	Recognize different classifications of construction drawings.
02.04	Interpret and use drawing dimensions.

03.0	Explain the properties of matter and heat behavior. The student will be able to:
03.01	Describe and explain freezing point, critical temperature and absolute zero.
03.02	Explain the gas laws (Dalton, Boyle and Charles) used when dealing with air and its properties.
03.03	Describe matter, heat and heat transfer.
03.04	Differentiate between heat and temperature.
03.05	Explain and distinguish among the characteristics of the three states of matter.
03.06	Explain the relationship between temperature and humidity.
03.07	Differentiate between latent heat and sensible heat.
04.0	Describe the history and concepts of heating, air-conditioning and refrigeration. The student will be able to:
04.01	Explain the basic principles of heating, ventilation and air-conditioning.
04.02	Identify the refrigeration cycle.
04.03	Identify and explain the four major refrigeration components.
04.04	Identify and explain the characteristics of a compression-cycle refrigerant system.
04.05	Differentiate between air-conditioning and refrigeration.
04.06	Differentiate between split systems, mini-splits and package systems.
04.07	Describe the benefits of conditioned air and indoor air quality.
04.08	Identify various professional organizations, associations and societies and explain their purposes.
04.09	Identify and explain the difference between a straight cool system and a heat pump.
05.0	Analyze fluids, pressures, refrigerants and related codes. The student will be able to:
05.01	Identify and explain general safety issues and EPA rules (especially EPA 608) and regulations regarding the handling of refrigerants.
05.02	Define and explain pressure, fluid and temperature.
05.03	Explain the standards for and ways to measure and calculate absolute and gauge pressures.
05.04	Identify and explain the classifications, properties and uses of different refrigerants based on chemical composition.

	05.05 Explain how fluids react and flow in a closed versus an open environment or vessel.
	05.06 Define and identify "color-coding" of refrigerant cylinders.
	05.07 Explain the proper methods of transferring, storing and recovering refrigerants.
	05.08 Explain the effects of an improper refrigerant and contaminants in a system.
	05.09 Identify the refrigerants in common use and state the types of applications in which each is used.
	05.10 Describe how azeotropes and near-azeotropes differ from each other and from so-called pure refrigerants.
	05.11 Compare and interpret a P-T chart for pure refrigerants, azeotrope, and near-azeotrope refrigerants and explain the difference between bubble point and dew point.
	05.12 Demonstrate refrigerant leak detecting methods.
	05.13 Identify the different types of oils used in refrigeration systems and explain their relationships to the various refrigerants.
	05.14 Explain how to add and remove oil from a system.
	05.15 Describe how to test oil and acid for contamination.
	05.16 Explain and differentiate HFO refrigerants from CFC, HCFC and HFC refrigerants.
	05.17 Explain the proper procedures in handling HFO refrigerants.
06.0	Evaluate heating, air-conditioning and refrigeration system components and accessories. The student will be able to:
	06.01 Explain the types, operation, use and requirements of
	• Compressors (such as reciprocating, rotary, screw, scroll and inverter)
	• Condensers and evaporators (such as evaporative condensers, evaporative coils, shell and tube, tube within a tube and fin and tube)
	• Metering devices (such as adjusting automatic and thermostatic expansion valves, fixed orifices, stepper motor electronic expansion valve (EEV), solenoid EEV and other devices available on the local market)
	06.02 Identify the location and explain the uses of refrigerant flow accessories.
	06.03 Identify the location and explain the uses of heating, air-conditioning and refrigeration-system accessories (such as receivers, dryers/filers, solenoid valves, heat exchangers, accumulators, suction filter, oil separators, evaporator pressure-regulating valve, crankcase pressure-regulating valves, hot gas bypass valves and check valves).
07.0	Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry. The student will be able to:

	07.01 Identify and explain the purpose of the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
	07.02 Bend tubing, using tube benders.
	07.03 Connect tubing using flared fittings, pressed fittings and compression fittings.
	07.04 Connect tubing, using a swaged-joint connection.
	07.05 Identify and use various types of torches.
	07.06 Identify, select and use appropriate brazing alloys, materials and skills.
	07.07 Explain the purposes and procedures for protecting piping materials and fabrication, such as valves, fittings and products from heat.
	07.08 Braze tubing while purging dry nitrogen.
	07.09 Silver-braze brass, steels and copper.
	07.10 Demonstrate an understanding of the procedures for installing pipe and tubing insulation.
	07.11 Explain the procedures required for installing heating, air-conditioning, refrigerant and ventilation accessories.
	07.12 Fabricate and leak-test the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
	07.13 Demonstrate proper safety measures when fabricating and servicing piping, tubing and fittings.
	07.14 Describe and demonstrate procedures for brazing dissimilar metals.
08.0	Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems. The student will be able to:
	08.01 Identify and explain the following heat-pump systems: air-to-air, water-to-air, water-to-water, air-to-ground (geothermal), open-loop and closed-loop.
	08.02 Determine the start-up and checkout procedures recommended by different manufacturers.
	08.03 Determine the temperature split/ difference across the outdoor coil on a heat pump.
	08.04 Determine the temperature split/ difference across the indoor coil on a heat pump.
	08.05 Apply good customer-relations skills.
09.0	Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing. The student will be able to:
	09.01 Identify and explain various types of heating, air-conditioning and refrigeration piping.
	09.02 Identify basic principles of sizing various heating, air conditioning, refrigeration and ventilation for various tasks.

	09.03 Explain pressure and temperature drops.
10.0	Interpret, use and modify construction drawings and specifications. The student will be able to:
	10.01 Read mechanical plans within a set of construction drawings explain their relationship.
	10.02 Compare mechanical plans with the actual installation of duct and pipe runs, fittings and sections.
	10.03 Interpret specification documents and apply them to the plans.
	10.04 Interpret shop drawings and apply them to the plans and specifications.
	10.05 Develop a field set of as-built drawings.
	10.06 Identify the steps required for transferring design information to component production.
	10.07 List and classify materials most commonly used in HVAC systems.
11.0	Balance an air distribution system. The student will be able to:
	11.01 Explain the fan and pump laws.
	11.02 Use a psychrometric chart to evaluate air properties and changes in air properties.
	11.03 Explain the principles involved in the balancing of air and water distribution systems.
	11.04 Define common terms used by manufacturers when describing grilles, registers and diffusers.
	11.05 Identify and use the tools and instruments needed to balance air distribution systems.
	11.06 Change the speed of an air distribution system supply fan.

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 co-curricular 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.

Florida Department of Education
Curriculum Framework

Program Title: **Residential Air Conditioning, Refrigeration & Heating Systems Technician**
Career Cluster: **Architecture and Construction**

CCC	
CIP Number	0615050102
Program Type	College Credit Certificate (CCC)
Program Length	24 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
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 air conditioning and heating technicians or to provide supplemental training for persons previously or currently employed in these occupations.

This certificate program is part of the Air Conditioning, Refrigeration, and Heating Systems Technology AAS degree program (0615050100).

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

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 communication skills, leadership skills, human relations and employability skills, and safe and efficient work practices. The program prepares students to assist in engineering departments or work independently, capable of designing, installing, maintaining and operating small or medium air conditioning, heating or refrigerating systems.

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

Standards

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

01.0 Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
02.0 Read construction documents.
03.0 Analyze fluids, pressures, refrigerants and related codes.
04.0 Evaluate heating, air-conditioning and refrigeration system components and accessories.
05.0 Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
06.0 Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems.
07.0 Use combustion-type heating servicing and testing equipment.
08.0 Understand the design of heating and cooling systems.
09.0 Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing.
10.0 Explain the standards for and ways to measure indoor-air quality.
11.0 (Optional) Maintain and repair thermal storage systems.
12.0 Interpret, use and modify construction drawings and specifications.
13.0 Balance an air distribution system.
14.0 Select energy conservation equipment.
15.0 Analyze building management systems.

Florida Department of Education
Student Performance Standards

Program Title: **Residential Air Conditioning, Refrigeration & Heating Systems Technician**
CIP Number: **0615050102**
Program Length: **24 Credit Hours**

This certificate program is part of the Air Conditioning, Refrigeration and Heating Systems Technology AAS degree program (0615050100). At the completion of this program, the student will be able to:	
01.0	Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
01.01	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.02	Explain the reasons for regular safety meetings and for company safety policies.
01.03	Explain the need for employee-background checks and medical examinations.
01.04	Identify appropriate fire extinguishers and other such safety devices.
01.05	Identify and follow emergency and rescue procedures.
01.06	Identify and use safe-handling practices as they relate to hazardous and volatile fluids, compounds and gases.
01.07	Demonstrate Occupational Safety and Health Administration (OSHA) 10, Environmental Protection Agency (EPA) practices, Department of Transportation (DOT) hazardous materials safety requirements, lock-out and tag out, and electrical safety.
01.08	Select and wear proper protective clothing and equipment.
01.09	Describe the purpose and requirements of local, state and federal heating, air-conditioning and refrigeration codes and standards as well as the manufacturer's installation instructions.
01.10	Identify and use OSHA practices when working with heating, air-conditioning and refrigeration systems and equipment.
01.11	Explain emergency procedures to follow in response to workplace accidents and understand a disaster and/or emergency response plan.
02.0	Read construction documents. The student will be able to:
02.01	Recognize and identify basic construction drawing terms, components and symbols.
02.02	Relate information on construction drawings to actual locations on the print.
02.03	Recognize different classifications of construction drawings.
02.04	Interpret and use drawing dimensions.

03.0	Analyze fluids, pressures, refrigerants and related codes. The student will be able to:
03.01	Identify and explain general safety issues and EPA rules (especially EPA 608) and regulations regarding the handling of refrigerants.
03.02	Define and explain pressure, fluid and temperature.
03.03	Explain the standards for and ways to measure and calculate absolute and gauge pressures.
03.04	Identify and explain the classifications, properties and uses of different refrigerants based on chemical composition.
03.05	Explain how fluids react and flow in a closed versus an open environment or vessel.
03.06	Define and identify "color-coding" of refrigerant cylinders.
03.07	Explain the proper methods of transferring, storing and recovering refrigerants.
03.08	Explain the effects of an improper refrigerant and contaminants in a system.
03.09	Identify the refrigerants in common use and state the types of applications in which each is used.
03.10	Describe how azeotropes and near-azeotropes differ from each other and from so-called pure refrigerants.
03.11	Compare and interpret a P-T chart for pure refrigerants, azeotrope, and near-azeotrope refrigerants and explain the difference between bubble point and dew point.
03.12	Demonstrate refrigerant leak detecting methods.
03.13	Identify the different types of oils used in refrigeration systems and explain their relationships to the various refrigerants.
03.14	Explain how to add and remove oil from a system.
03.15	Describe how to test oil and acid for contamination.
03.16	Explain and differentiate HFO refrigerants from CFC, HCFC and HFC refrigerants.
03.17	Explain the proper procedures in handling HFO refrigerants.
04.0	Evaluate heating, air-conditioning and refrigeration system components and accessories. The student will be able to:
04.01	Explain the types, operation, use and requirements of
	• Compressors (such as reciprocating, rotary, screw, scroll and inverter)
	• Condensers and evaporators (such as evaporative condensers, evaporative coils, shell and tube, tube within a tube and fin and tube)

		• Metering devices (such as adjusting automatic and thermostatic expansion valves, fixed orifices, stepper motor electronic expansion valve (EEV), solenoid EEV and other devices available on the local market)
	04.02	Identify the location and explain the uses of refrigerant flow accessories.
	04.03	Identify the location and explain the uses of heating, air-conditioning and refrigeration-system accessories (such as receivers, dryers/filers, solenoid valves, heat exchangers, accumulators, suction filter, oil separators, evaporator pressure-regulating valve, crankcase pressure-regulating valves, hot gas bypass valves and check valves).
05.0	Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry. The student will be able to:	
	05.01	Identify and explain the purpose of the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
	05.02	Bend tubing, using tube benders.
	05.03	Connect tubing using flared fittings, pressed fittings and compression fittings.
	05.04	Connect tubing, using a swaged-joint connection.
	05.05	Identify and use various types of torches.
	05.06	Identify, select and use appropriate brazing alloys, materials and skills.
	05.07	Explain the purposes and procedures for protecting piping materials and fabrication, such as valves, fittings and products from heat.
	05.08	Braze tubing while purging dry nitrogen.
	05.09	Silver-braze brass, steels and copper.
	05.10	Demonstrate an understanding of the procedures for installing pipe and tubing insulation.
	05.11	Explain the procedures required for installing heating, air-conditioning, refrigerant and ventilation accessories.
	05.12	Fabricate and leak-test the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
	05.13	Demonstrate proper safety measures when fabricating and servicing piping, tubing and fittings.
	05.14	Describe and demonstrate procedures for brazing dissimilar metals.
06.0	Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems. The student will be able to:	
	06.01	Identify and explain the following heat-pump systems: air-to-air, water-to-air, water-to-water, air-to-ground (geothermal), open-loop and closed-loop.
	06.02	Determine the start-up and checkout procedures recommended by different manufacturers.

	06.03 Determine the temperature split/ difference across the outdoor coil on a heat pump.
	06.04 Determine the temperature split/ difference across the indoor coil on a heat pump.
	06.05 Apply good customer-relations skills.
07.0	Use combustion-type heating servicing and testing equipment. The student will be able to:
	07.01 Explain combustion theory and the safety precautions for using combustion-type-heating servicing and testing equipment.
	07.02 Identify and explain the various types of combustion-type heating servicing and testing equipment (such as draft gauge, U-tube manometer, sling psychrometer, millivolt meter and oil-furnace testing equipment).
	07.03 Use the servicing and testing equipment.
	07.04 Test, analyze and troubleshoot combustion-type-heating systems.
08.0	Understand the design of heating and cooling systems. The student will be able to:
	08.01 Identify and describe the steps in the system design process.
	08.02 Use construction drawings or an actual job site to obtain information needed to complete heating and cooling load estimates.
	08.03 Identify the factors that affect heat gains and losses to a building and describe how these factors influence the design process.
	08.04 Complete a load estimate to determine the heating and/or cooling load of a building.
	08.05 State the principles that affect the selection of equipment to satisfy the calculated heating and/or cooling load.
	08.06 Select heating and/or cooling equipment using manufacturers' product data.
	08.07 Identify the various types of duct systems and explain why and where each type is used.
	08.08 Demonstrate the effect of fittings and transitions on duct system design.
	08.09 Use a friction loss chart and duct sizing table to size duct.
	08.10 Install insulation and vapor barriers used in duct systems.
	08.11 Select and install refrigerant and condensate piping following proper design principles.
	08.12 Describe airflow and pressures in a basic forced-air distribution system.
	08.13 Explain the differences between propeller and centrifugal fans and blowers.
	08.14 Identify the various types of duct systems and explain why and where each type is used.

	08.15 Demonstrate or explain the installation of metal, fiberboard and flexible duct.
	08.16 Demonstrate or explain the installation of fittings and transitions used in duct systems.
	08.17 Identify and explain the operations of electrical control systems and their components (zone damper motors).
	08.18 Demonstrate or explain the use and installation of dampers used in duct systems.
	08.19 Demonstrate or explain the use and installation of insulation and vapor barriers used in duct systems.
	08.20 Identify instruments used to make measurements in air systems and explain the use of each instrument.
	08.21 Make basic temperature, air pressure and velocity measurements in an air distribution system.
	08.22 Complete a Manual D Duct design according to heat load calculations.
09.0	Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing. The student will be able to:
	09.01 Identify and explain various types of heating, air-conditioning and refrigeration piping.
	09.02 Identify basic principles of sizing various heating, air conditioning, refrigeration and ventilation for various tasks.
	09.03 Explain pressure and temperature drops.
10.0	Explain the standards for and ways to measure indoor-air quality. The student will be able to:
	10.01 Identify and explain the codes and standards regarding indoor-air quality.
	10.02 Select and use indoor-air-quality measuring devices.
	10.03 Explain the standards for and ways to measure indoor-air quality using various methods.
11.0	(Optional) Maintain and repair thermal storage systems. The student will be able to:
	11.01 Apply appropriate codes, standards and safety practices.
	11.02 Describe the benefits and limitations of each type.
	11.03 Explain the operational principles of a thermal storage system.
	11.04 Identify and explain various types of thermal storage systems.
	11.05 Troubleshoot and test various types of thermal storage systems.
12.0	Interpret, use and modify construction drawings and specifications. The student will be able to:

	12.01 Read mechanical plans within a set of construction drawings explain their relationship.
	12.02 Compare mechanical plans with the actual installation of duct and pipe runs, fittings and sections.
	12.03 Interpret specification documents and apply them to the plans.
	12.04 Interpret shop drawings and apply them to the plans and specifications.
	12.05 Develop a field set of as-built drawings.
	12.06 Identify the steps required for transferring design information to component production.
	12.07 List and classify materials most commonly used in HVAC systems.
13.0	Balance an air distribution system. The student will be able to:
	13.01 Explain the fan and pump laws.
	13.02 Use a psychrometric chart to evaluate air properties and changes in air properties.
	13.03 Explain the principles involved in the balancing of air and water distribution systems.
	13.04 Define common terms used by manufacturers when describing grilles, registers and diffusers.
	13.05 Identify and use the tools and instruments needed to balance air distribution systems.
	13.06 Change the speed of an air distribution system supply fan.
14.0	Select energy conservation equipment. The student will be able to:
	14.01 Identify and explain the operation of energy conservation equipment.
	14.02 Operate selected energy conservation equipment.
15.0	Analyze building management systems. The student will be able to:
	15.01 Identify the major components of a building management system and describe how they fit together.
	15.02 Explain a basic direct digital controller.

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 co-curricular 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.

Florida Department of Education
Curriculum Framework

Program Title: **Building Construction Specialist**
Career Cluster: **Architecture and Construction**

CCC	
CIP Number	0615100103
Program Type	College Credit Certificate (CCC)
Program Length	18 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
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 Construction Specialists, Construction Managers, Construction and Building Inspectors, Quality Control Assistant; Scheduler; Materials Tester in the areas of estimating, scheduling, and interpreting plans or to provide supplemental training for persons previously or currently employed in these occupations. It provides a foundation in pursuing a career in building inspection and quality control.

This certificate program is part of the Building Construction Technology AS degree program (1615100102).

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

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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.

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

Standards

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

01.0 Communicate effectively with technical and non-technical audiences.
02.0 Identify appropriate grade, quality, use and selection of building materials and methods of construction.
03.0 Draw, read and interpret drawings and specifications.
04.0 Demonstrate knowledge of materials and methods of construction.
05.0 Determine take off quantities and estimate costs.
06.0 Understand the basic processes of construction management (plan, schedule and control projects).
07.0 Understand various building inspections and required testing.
08.0 Demonstrate an efficient understanding of construction documentation.
09.0 Demonstrate appropriate math skills.
10.0 Demonstrate employability skills. (optional)

Florida Department of Education
Student Performance Standards

Program Title: **Building Construction Specialist**
CIP Number: **0615100103**
Program Length: **18 Credit Hours**

This certificate program is part of the Building Construction Technology AS degree program (1615100102). At the completion of this program, the student will be able to:	
01.0	Communicate effectively with technical and non-technical audiences. The student will be able to:
01.01	Create written communications appropriate to the construction discipline.
01.02	Understand the daily project report process.
01.03	Understand the requisition processes for equipment and materials.
01.04	Understand the process for preparing minutes from job-site meetings.
01.05	Write logical and understandable statements or phrases to accurately fill out forms and invoices commonly used in business and industry.
01.06	Read and understand graphs, charts, diagrams and tables commonly used in this industry/occupation area.
01.07	Read and follow written, oral and graphic instructions.
01.08	Answer and ask questions coherently and concisely.
02.0	Identify appropriate grade, quality, use and selection of building materials and methods of construction. The student will be able to:
02.01	Identify structural materials, assemblies and finishes.
02.02	Identify mechanical, plumbing and electrical components and equipment. (optional)
03.0	Draw, read and interpret drawings and specifications. The student will be able to:
03.01	Take site notes and measurements.
03.02	Interpret construction drawings and specifications.
03.03	Understand the shop drawing submittal and review process.
04.0	Demonstrate knowledge of materials and methods of construction. The student will be able to:

	04.01 Understand the materials and methods of construction identified with the Construction Specification Institute (CSI) format, as appropriate.
	04.02 Examine construction techniques associated with wood, steel, masonry and reinforced concrete framing systems, roof systems, interior and exterior finishes, etc.
	04.03 Understand the purpose of mechanical tests and quality control tests for common construction materials.
	04.04 Understand appropriateness and sustainability of materials for construction projects.
	04.05 Understand material behavior as a result of temperature extremes, chemical reaction, moisture content, etc.
	04.06 Understand the applications of common construction equipment for hoisting materials, erecting structures, and earthmoving.
	04.07 Understand pressure measurement in terms of Pounds per Square Inch (PSI).
	04.08 Extract and interpret information from building codes and standards. (optional)
05.0	Determine take off quantities and estimate costs. The student will be able to:
	05.01 Make mathematical and geometrical calculations.
	05.02 Estimate quantities of construction materials.
	05.03 Compile lists of sub-trades for project.
	05.04 Analyze and project labor unit costs.
	05.05 Analyze and project site overhead costs.
	05.06 Evaluate sub trade bids. (optional)
	05.07 Summarize project cost and complete bid prices. (optional)
06.0	Understand the basic processes of construction management (plan, coordinate, schedule and control projects). The student will be able to:
	06.01 Prepare construction schedules using commonly used project management software.
	06.02 Understand the schedule update process for project control.
07.0	Understand various building inspections and required testing. The student will be able to:
	07.01 Understand building inspections required at the various phases of the construction process.
	07.02 Understand various tests for construction quality assurance.

08.0	Demonstrate an efficient understanding of construction documentation. The student will be able to:
	08.01 Organize the office and field work areas.
	08.02 Select and use appropriate forms and computer software.
	08.03 Develop and maintain a filing system for construction documentation (submittals, RFI's, change orders, etc.).
09.0	Demonstrate appropriate math skills. The student will be able to:
	09.01 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares and cylinders.
	09.02 Measure tolerances on horizontal and vertical surfaces using Metric and/or English units.
	09.03 Add, subtract, multiply and divide using fractions, decimals and whole numbers.
	09.04 Determine the correct purchase price, to include sales tax, for a materials list containing a minimum of six items.
	09.05 Demonstrate an understanding of federal, state and local taxes and their computation.
10.0	Demonstrate employability skills. (optional) The student will be able to:
	10.01 Understand the process of conducting a job search for employment.
	10.02 Secure information about a job.
	10.03 Obtain and compile documents which may be required when applying for a job interview.
	10.04 Complete and submit a job application.
	10.05 Demonstrate competence in job interview techniques.
	10.06 Identify or demonstrate appropriate responses to criticism in the workplace.
	10.07 Identify good work habits.

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Florida Department of Education
Curriculum Framework

Program Title: **Advanced Computer-Aided Design Technical Certificate**
Career Cluster: **Architecture and Construction**

CCC	
CIP Number	0615130200
Program Type	College Credit Certificate (CCC)
Program Length	22 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
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 architectural, civil, surveying, structural, and/or mechanical CAD/CAM draftspersons, plans examiners, design drafters, and for further career advancement in the design, construction and manufacturing industries.

This certificate program is part of the Computer-Aided Drafting and Design AS degree program (1615130202).

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

This program offers courses that provides technical knowledge and skills needed to prepare for further education and careers in the architecture, construction, civil, surveying, structural and mechanical drafting industry. Program content prepares students to create detailed drawings for builders and manufacturers to construct and produce products.

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

Standards

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

01.0 Apply fundamental drafting skills.
02.0 Prepare Computer-Aided Drafting (CAD) drawings.
03.0 Prepare architectural, engineering and construction (AEC) drawings.
04.0 Apply technical mathematics.
05.0 Prepare civil engineering drawings. (Optional)
06.0 Prepare mechanical drawings. (Optional)
07.0 Demonstrate employability and soft skills. (Optional)

Florida Department of Education
Student Performance Standards

Program Title: **Advanced Computer-Aided Design Technical Certificate**
CIP Number: **0615130200**
Program Length: **22 Credit Hours**

This certificate program is part of the Computer-Aided Drafting and Design AS degree program (1615020202). At the completion of this program, the student will be able to:	
01.0	Apply fundamental drafting skills. The student will be able to:
01.01	Operate drafting instruments.
01.02	Perform lettering techniques.
01.03	Prepare multi-view drawings.
01.04	Prepare section and detail drawings.
01.05	Prepare supplemental auxiliary views.
01.06	Prepare dimension drawings.
01.07	Prepare pictorial drawings (e.g., isometric, perspectives, etc.).
01.08	Prepare sketches and/or renderings.
01.09	Prepare title blocks, borders, general notes, symbols, abbreviations, and legends.
01.10	Compile a portfolio of drawings and/or other works.
02.0	Prepare Computer-Aided Drafting (CAD) drawings. The student will be able to:
02.01	Utilize a graphical user interface.
02.02	Perform standard drafting procedures.
02.03	Operate peripheral equipment, such as printers, plotters, scanners, etc.
02.04	Apply CAD drawing standards as established and updated by the industry.
02.05	Construct various geometric figures of lines and shapes.
02.06	Create and edit text using appropriate style and size to annotate drawings.

	02.07 Use and control accuracy-enhancement tools for entity-positioning methods, such as snap, XYZ and coordinate systems.
	02.08 Identify, create, store, and use standard part symbols and libraries.
	02.09 Use editing commands to modify objects.
	02.10 Control entity properties by layer (i.e., color, line type and line weight).
	02.11 Use viewing commands to perform zooming and panning.
	02.12 Plot drawings on media using layout and scale.
	02.13 Use query commands to access the database for entity characteristics, distance, area and status.
	02.14 Apply standard dimensioning rules.
	02.15 Export CAD drawings to web format.
	02.16 Demonstrate an understanding of point sources in 3-D.
	02.17 Apply Computer-Aided Modeling.
	02.18 Demonstrate a fundamental understanding of Building Information Modeling (BIM).
	02.19 Apply specialized CAD functions, such as 3-Dimensional (3D) modeling, CAD rendering, CNC milling, etc. (Optional)
03.0	Prepare architectural, engineering and construction (AEC) drawings. The student will be able to:
	03.01 Prepare floor plan drawings.
	03.02 Prepare foundation plan.
	03.03 Prepare elevation drawings.
	03.04 Prepare schedules.
	03.05 Prepare sections and detail drawings.
	03.06 Build architectural models.
	03.07 Prepare plot and site plan drawings.
	03.08 Create basic structural drawings and detailing conventions.
	03.09 Demonstrate an understanding of construction materials, methods and techniques.

	03.10 Develop a virtual building model using BIM software.
	03.11 Prepare drawing sheets from a BIM model.
	03.12 Prepare landscape layouts. (Optional)
	03.13 Prepare wood roof framing plan (Optional).
	03.14 Prepare stairway drawings. (Optional).
	03.15 Prepare fireplace drawings. (Optional).
	03.16 Prepare plumbing fixture layout drawings (Optional).
	03.17 Prepare Heating, Ventilation and Air-Conditioning (HVAC) equipment layout drawings (Optional).
	03.18 Prepare residential electrical plan drawings (Optional).
	03.19 Prepare perspective and isometric drawings (Optional).
	03.20 Develop a computational design algorithm (Optional).
04.0	Apply technical mathematics. The student will be able to:
	04.01 Solve arithmetic problems.
	04.02 Solve algebra problems.
	04.03 Solve geometry problems.
	04.04 Solve trigonometry problems. (Optional)
	04.05 Solve surveying problems. (Optional)
05.0	Prepare civil engineering drawings. (Optional) The student will be able to:
	05.01 Apply drafting techniques.
	05.02 Apply surveying fundamentals.
	05.03 Demonstrate an understanding of and apply mapping scales.
	05.04 Read and interpret legal descriptions and plot plans.
	05.05 Read, interpret and draw contour lines.

	05.06 Draw roadway and/or street layouts.
06.0	Prepare mechanical drawings. (Optional) The student will be able to:
	06.01 Prepare fastener drawings.
	06.02 Prepare assembly drawings.
	06.03 Prepare detail and section drawings.
	06.04 Prepare technical drawings.
	06.05 Prepare spring drawings.
	06.06 Prepare casting drawings.
	06.07 Prepare computer-aided drawings.
	06.08 Prepare material specifications and parts list.
	06.09 Identify geometric tolerances and dimensioning of specific machined surfaces.
	06.10 Prepare cam drawings. (Optional, if standard is taught)
	06.11 Prepare gear drawings. (Optional, if standard is taught)
	06.12 Prepare welding drawings. (Optional, if standard is taught)
	06.13 Prepare bearing drawings. (Optional, if standard is taught)
	06.14 Prepare forging drawings. (Optional, if standard is taught)
	06.15 Prepare tool drawings. (Optional, if standard is taught)
	06.16 Prepare molding diagrams. (Optional, if standard is taught)
	06.17 Prepare stamping drawings. (Optional, if standard is taught)
	06.18 Prepare numerical-control drawings. (Optional, if standard is taught)
07.0	Demonstrate employability and soft skills. (Optional) The student will be able to:
	07.01 Conduct a job search.
	07.02 Obtain information about a job.

07.03 Prepare documents that may be required when applying for a job.
07.04 Complete a job application form correctly.
07.05 Demonstrate competence in job interview techniques.
07.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other employees.
07.07 Exhibit acceptable work habits and the ability to work remotely.
07.08 Demonstrate knowledge of how to make job changes appropriately.
07.09 Demonstrate acceptable employee health habits.
07.10 Act in a professional manner.
07.11 Prepare a work portfolio and resume.

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)

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Accommodations

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

Florida Department of Education
Curriculum Framework

Program Title: **Computer-Aided Design Technical Certificate**
Career Cluster: **Architecture and Construction**

CCC	
CIP Number	0615130204
Program Type	College Credit Certificate (CCC)
Program Length	14 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
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 architectural, civil, surveying, structural, and/or mechanical CAD/CAM draftspersons, plans examiners, design drafters, and for further career advancement in the design, construction and manufacturing industries.

This certificate program is part of the Computer-Aided Drafting and Design AS degree program (1615130202).

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

This program offers courses that provides technical knowledge and skills needed to prepare for further education and careers in the architecture, construction, civil, surveying, structural and mechanical drafting industry. Program content prepares students to create detailed drawings for builders and manufacturers to construct and produce products.

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

Standards

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

01.0 Apply fundamental drafting skills.
02.0 Prepare Computer-Aided Drafting (CAD) drawings.
03.0 Apply technical mathematics.
04.0 Prepare architectural engineering and construction (AEC) drawings. (Optional)
05.0 Prepare civil engineering drawings. (Optional)
06.0 Prepare mechanical drawings. (Optional)

Florida Department of Education
Student Performance Standards

Program Title: **Computer-Aided Design Technical Certificate**
CIP Number: **0615130204**
Program Length: **14 credit hours**

This certificate program is part of the Computer-Aided Drafting and Design AS degree program (1615130202). At the completion of this program, the student will be able to:	
01.0	Apply fundamental drafting skills. The student will be able to:
01.01	Operate drafting instruments.
01.02	Perform lettering techniques.
01.03	Prepare multi-view drawings.
01.04	Prepare section and detail drawings.
01.05	Prepare supplemental auxiliary views.
01.06	Prepare dimension drawings.
01.07	Prepare pictorial drawings (e.g., isometric, perspectives).
01.08	Prepare sketches and/or renderings.
01.09	Prepare title blocks, borders, general notes, symbols, abbreviations, and legends.
01.10	Compile a portfolio of drawings and/or other works.
02.0	Prepare Computer-Aided Drafting (CAD) drawings. The student will be able to:
02.01	Utilize a graphical user interface.
02.02	Perform standard drafting procedures.
02.03	Operate peripheral equipment, such as printers, plotters, scanners, etc.
02.04	Apply CAD drawing standards as established and updated by the industry.
02.05	Construct various geometric figures of lines and shapes.
02.06	Create and edit text using appropriate style and size to annotate drawings.

	02.07 Use and control accuracy-enhancement tools for entity-positioning methods, such as snap, XYZ and coordinate systems.
	02.08 Identify, create, store, and use standard part symbols and libraries.
	02.09 Use editing commands to modify objects.
	02.10 Control entity properties by layer (i.e., color, line type and line weight).
	02.11 Use viewing commands to perform zooming and panning.
	02.12 Plot drawings on media using layout and scale.
	02.13 Use query commands to access the database for entity characteristics, distance, area and status.
	02.14 Apply standard dimensioning rules.
	02.15 Export CAD drawings to web format.
	02.16 Demonstrate an understanding of point sources in 3-D.
	02.17 Apply Computer-Aided Modeling.
	02.18 Demonstrate a fundamental understanding of Building Information Modeling (BIM).
	02.19 Apply specialized CAD functions, such as 3-Dimensional (3D) modeling, CAD rendering, CNC milling, etc. (Optional)
03.0	Apply technical mathematics. The student will be able to:
	03.01 Solve arithmetic problems.
	03.02 Solve algebra problems.
	03.03 Solve geometry problems.
	03.04 Solve trigonometry problems. (Optional)
	03.05 Solve surveying problems. (Optional)
04.0	Prepare architectural, engineering and construction (AEC) drawings. (Optional) The student will be able to:
	04.01 Prepare floor plan drawings.
	04.02 Prepare foundation plan.
	04.03 Prepare elevation drawings.

	04.04 Prepare schedules.
	04.05 Prepare sections and detail drawings.
	04.06 Build architectural models.
	04.07 Prepare plot and site plan drawings.
	04.08 Create basic structural drawings and detailing conventions.
	04.09 Demonstrate an understanding of construction materials, methods and techniques.
	04.10 Develop a virtual building model using BIM software.
	04.11 Prepare drawing sheets from a BIM model.
	04.12 Prepare landscape layouts. (Optional, if standard is taught)
	04.13 Prepare wood roof framing plan. (Optional, if standard is taught)
	04.14 Prepare stairway drawings. (Optional, if standard is taught)
	04.15 Prepare fireplace drawings. (Optional, if standard is taught)
	04.16 Prepare plumbing fixture layout drawings. (Optional, if standard is taught)
	04.17 Prepare Heating, Ventilation and Air-Conditioning (HVAC) equipment layout drawings. (Optional, if standard is taught)
	04.18 Prepare residential electrical plan drawings. (Optional, if standard is taught)
	04.19 Prepare perspective and isometric drawings. (Optional, if standard is taught)
	04.20 Develop a computational design algorithm. (Optional, if standard is taught)
05.0	Prepare civil engineering drawings. (Optional) The student will be able to:
	05.01 Apply drafting techniques.
	05.02 Apply surveying fundamentals.
	05.03 Demonstrate an understanding of and apply mapping scales.
	05.04 Read and interpret legal descriptions and plot plans.
	05.05 Read, interpret and draw contour lines.

	05.06 Draw roadway and/or street layouts.
06.0	Prepare mechanical drawings. (Optional) The student will be able to:
	06.01 Prepare fastener drawings.
	06.02 Prepare assembly drawings.
	06.03 Prepare detail and section drawings.
	06.04 Prepare technical drawings.
	06.05 Prepare spring drawings.
	06.06 Prepare casting drawings.
	06.07 Prepare computer-aided drawings.
	06.08 Prepare material specifications and parts list.
	06.09 Identify geometric tolerances and dimensioning of specific machined surfaces.
	06.10 Prepare cam drawings. (Optional, if standard is taught)
	06.11 Prepare gear drawings. (Optional, if standard is taught)
	06.12 Prepare welding drawings. (Optional, if standard is taught)
	06.13 Prepare bearing drawings. (Optional, if standard is taught)
	06.14 Prepare forging drawings. (Optional, if standard is taught)
	06.15 Prepare tool drawings. (Optional, if standard is taught)
	06.16 Prepare molding diagrams. (Optional, if standard is taught)
	06.17 Prepare stamping drawings. (Optional, if standard is taught)
	06.18 Prepare numerical-control drawings. (Optional, if standard is taught)

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 co-curricular 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.

Florida Department of Education
Curriculum Framework

Program Title: **Sustainable Design**
Career Cluster: **Architecture and Construction**

CCC	
CIP Number	0630330106
Program Type	College Credit Certificate (CCC)
Program Length	19 Credit Hours
CTSO	Skills USA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
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 CAD draftspersons, residential and small commercial designers, plan examiners, and to help prepare students to become residential and building contractors. The program also helps to prepare students to further their education in architecture and/or construction.

This certificate program is part of the Architectural Design and Construction Technology AS degree program (1604090100).

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.).

The program offers courses that teach technical knowledge and skills in drafting, design, and construction needed to design and build the next generation of crafted, code compliant, healthy, comfortable, resource efficient, durable houses and buildings based on sustainable design strategies, applied building science principles, and mainstream green building practices.

The content includes but is not limited to communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, assisting architects and architectural engineers in planning and designing structures, using construction materials, and dealing with contracts and specifications.

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

Standards

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

01.0 Demonstrate appropriate communicate skills.
02.0 Identify, select, apply and maintain drafting, drawing and graphic materials and equipment, including both table top drafting and Computer Aided Drafting (CAD).
03.0 Identify construction materials and their application.
04.0 Interpret construction drawings and documents.
05.0 Understand and apply fundamental principles of architectural and engineering design.
06.0 Interpret and apply building code regulations and product technical literature.
07.0 Produce architectural working drawings using both table top drafting and CAD.
08.0 Prepare subcontractor shop drawings using both table top drafting and CAD.
09.0 Estimate basic quantities of materials.
10.0 Demonstrate appropriate math skills.
11.0 Understand sustainability issues related to the design, construction and maintenance of the built environment.

Florida Department of Education
Student Performance Standards

Program Title: **Sustainable Design**
CIP Number: **0630330106**
Program Length: **19 Credit Hours**

This certificate program is part of the Architectural Design and Construction Technology AS degree program (1604090100). At the completion of this program, the student will be able to:	
01.0	Demonstrate appropriate communicate skills. The student will be able to:
01.01	Identify communication channels in organizations.
01.02	Develop and use effective means of communications.
01.03	Develop an effective working relationships with others.
01.04	Prepare accurate business correspondence, memos, forms/invoices, reports, etc.
01.05	Compose clear and concise oral and written technical reports and presentations.
01.06	Participate in technical discussions and meetings.
01.07	Read and understand graphs, charts, diagrams and tables commonly used in this industry/occupation area.
01.08	Read and follow written and oral instructions.
01.09	Answer and ask questions coherently and concisely.
01.10	Read critically by recognizing assumptions and implications and by evaluating ideas.
02.0	Identify, select, apply and maintain drafting, drawing and graphic materials and equipment, including both table top drafting and Computer Aided Drafting (CAD). The student will be able to:
02.01	Use architectural and engineering scales.
02.02	Select, apply and maintain basic drawing instruments including both table top drafting tools and computer hardware devices and software programs.
02.03	Identify and select leads, lead holders, sharpeners and erasers for table top drafting.
02.04	Identify and select reproduction materials including plotters, laser printers, inkjet printers and blueprint machines.
02.05	Set up and maintain drafting table, T-square and parallel rule.

02.06	Identify, select and apply color markers and pencils.
02.07	Operate calculators and use spreadsheets.
02.08	Identify, maintain and operate photography equipment.
02.09	Apply and develop freehand lettering and drawing techniques.
03.0	Identify construction materials and their application. The student will be able to:
03.01	Identify and specify paving materials and applications.
03.02	Identify and specify formwork materials and methods.
03.03	Identify and specify concrete materials and applications.
03.04	Identify and specify reinforcing steel and applications.
03.05	Identify and specify masonry materials and applications.
03.06	Identify and specify structural steel shapes, materials and applications.
03.07	Identify and specify miscellaneous metal components and applications.
03.08	Identify and specify wood construction materials and applications.
03.09	Identify and specify millwork, finished carpentry, trim details, cabinets and other finish carpentry applications.
03.10	Identify and specify adhesives and sealants and applications.
03.11	Identify and specify plastic laminates and applications.
03.12	Identify and specify waterproofing materials and vapor barriers and applications.
03.13	Identify and specify insulation materials and their applications to create thermal boundaries.
03.14	Identify and specify roofing materials and applications.
03.15	Identify and specify flashings and applications.
03.16	Identify and specify glazing materials for windows, doors and other openings.
03.17	Identify and specify exterior cladding finishes and applications.
03.18	Identify and specify floor finish materials and applications.

	03.19 Identify and specify wall finish materials and applications.
	03.20 Identify and specify ceiling finish materials and applications.
	03.21 Identify and specify fire proofing materials and applications.
	03.22 Identify and specify interior and exterior finish hardware and applications.
	03.23 Identify and specify manufactured specialty products and applications.
	03.24 Identify and specify applications of pre-engineered and prefabricated structures.
	03.25 Identify and specify common plumbing components.
	03.26 Identify and specify Heating, Ventilation and Air-Conditioning (HVAC) equipment and components.
	03.27 Identify and specify common electrical components.
04.0	Interpret construction drawings and documents. The student will be able to:
	04.01 Interpret technical symbols.
	04.02 Interpret topographical drawings.
	04.03 Interpret aerial photographs and maps.
	04.04 Interpret site drawings.
	04.05 Interpret architectural drawings.
	04.06 Interpret written specifications.
	04.07 Interpret addendums.
	04.08 Interpret shop drawings.
	04.09 Interpret mechanical drawings.
	04.10 Interpret electrical drawings.
	04.11 Interpret development plans and documents.
05.0	Understand and apply fundamental principles of architectural and engineering design. The student will be able to:
	05.01 Understand soil analysis reports.

	05.02 Understand compaction tests and reports.
	05.03 Understand the fundamentals of building site requirements.
	05.04 Determine and apply space relationships.
06.0	Interpret and apply building code regulations and product technical literature. The student will be able to:
	06.01 Use appropriate time-saving reference materials.
	06.02 Interpret and apply state and national building codes, in-particular the International Building Codes (IBC), and Florida Building codes.
	06.03 Interpret and apply local municipal codes and regulations.
	06.04 Interpret zoning bylaws and regulations.
	06.05 Interpret zoning maps.
	06.06 Read building and architectural trade magazines and catalogs.
	06.07 Apply regional building estimating costs.
	06.08 Be aware of local, regional and state building and architectural association’s current legislative regulations.
07.0	Produce architectural working drawings using both table top drafting and CAD. The student will be able to:
	07.01 Prepare floor plan drawings.
	07.02 Prepare elevation drawings.
	07.03 Prepare landscape layouts.
	07.04 Prepare material and product schedules.
	07.05 Prepare section drawings.
	07.06 Build architectural models.
	07.07 Prepare plot and site plan drawings.
08.0	Prepare subcontractor shop drawings using both table top drafting and CAD. The student will be able to:
	08.01 Prepare plumbing fixture and appliance layout plan drawings.
	08.02 Prepare thermal building enclosure construction drawings that include insulation and air barrier details.

	08.03 Prepare electrical plan drawings.
09.0	Estimate basic quantities of materials. The student will be able to:
	09.01 Compute area and volume of buildings.
	09.02 Estimate quantities of excavation and fill.
	09.03 Take off quantities of form work.
	09.04 Take off quantities of concrete.
	09.05 Take off quantities of lumber.
	09.06 Take off quantities of masonry.
	09.07 Interpret and complete standard estimator's form.
	09.08 Apply the use of computer estimating software.
	09.09 Understand and create construction budgets.
10.0	Demonstrate appropriate math skills. The student will be able to:
	10.01 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares and cylinders.
	10.02 Add, subtract, multiply and divide using fractions, decimals and whole numbers.
	10.03 Determine the correct purchase price, to include sales tax for a quantity of materials.
11.0	Understand sustainability issues related to the design, construction and maintenance of the built environment. The student will be able to:
	11.01 Describe the impact of the construction industry on the natural environment.
	11.02 Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.
	11.03 Identify and analyze sustainable alternatives to conventional construction practices.
	11.04 Identify specific design and construction principles, practices and strategies that lessen adverse impacts on the natural environment.
	11.05 Know various building design and construction energy analysis tools and software that help to determine the buildings performance before it is constructed.
	11.06 Identify design features, appropriate construction details and maintenance practices that contribute to a project's overall sustainability.

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 co-curricular 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.

Florida Department of Education
Curriculum Framework

Program Title: **Field Survey Technician**
Career Cluster: **Architecture and Construction**

CCC	
CIP Number	0715020102
Program Type	College Credit
Program Length	18 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
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 certificate program is part of the Civil Engineering Technology AS degree program (1715020101).

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

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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.

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 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.
06.0 Identify the use of the various materials of selected industries.
07.0 Solve engineering graphics problems using standard techniques, reference materials and civil engineering and/or surveying software.
08.0 Solve basic hydraulic problems using the theory of incompressible fluids. (Optional)
09.0 Establish grades, locate property lines and utilities, produce plots, and calculate cut and fill.
10.0 Demonstrate employability skills.
11.0 Demonstrate appropriate communication and coordination skills.

Florida Department of Education
Student Performance Standards

Program Title: **Field Survey Technician**
CIP Number: **0715020102**
Program Length: **18 credit hours**

This certificate program is part of the Civil Engineering Technology AS degree program (1715020101). 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	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:
	05.01 Understand the importance of surveying fundamentals, including units of measurement, significant figures, errors in observations, and coordinate geometry.
	05.02 Apply fundamental engineering skills to include the use of engineer's tape, plumb bobs, field book and calculator. (Optional)
	05.03 Utilize total station to gain an understanding of horizontal measurements (angles, azimuths, and bearings).
	05.04 Utilize automatic level to gain an understanding of vertical measurements (elevations).
	05.05 Utilize Global Positioning System (GPS) and understand how this methodology can be utilized for both horizontal and vertical measurements
	05.06 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.*
	05.07 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).
	05.08 Understand and apply the fundamentals of Geographic Information Systems (GIS). (Optional)
06.0	Identify the use of the various materials of selected industries. The student will be able to:
	06.01 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.
	06.02 Identify and explain the use of reinforcing steel and its common applications.
	06.03 Identify concrete structures.
	06.04 Identify asphalt types and uses.
	06.05 Identify corrosion preventing methods including coatings.
07.0	Solve engineering graphics problems using standard techniques, reference materials and civil engineering and/or surveying software. The student will be able to:

	07.01 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).
	07.02 Use typical design standards.
	07.03 Use civil engineering and/or surveying software for the analysis of the hydrology of small watersheds.
	07.04 Use county soil survey by soil conservation service (US Department of Agriculture assisted by Geographic Information System data).
	07.05 Prepare a topographic map of a subdivision with standard soil types.
	07.06 Using current software and the prepared soils type map, compute peak run off.
	07.07 Use GIS and available data sets to identify areas prone to flooding. (Optional)
	07.08 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)
08.0	Solve basic hydraulic problems using the theory of incompressible fluids. (Optional) The student will be able to:
	08.01 Compute peak discharge.
	08.02 Compute discharge due to developed condition of project.
	08.03 Compute quantity of water and wastewater flow and size pressure pipes.
	08.04 Calculate slopes to determine proper drainage of impervious surfaces and storm sewers.
	08.05 Size pipes for gravity flow of storm waters.
09.0	Establish grades, locate property lines and utilities, produce plots, and calculate cut and fill. The student will be able to:
	09.01 Calculate horizontal alignment for civil engineering structures.
	09.02 Calculate vertical alignment for civil engineering structures.
	09.03 Create maps, plats, plans and profiles, cross sections, charts and graphs.
	09.04 Calculate earthwork quantities.
	09.05 Calculate material quantities.
	09.06 Draft storm sewers, sanitary sewers, water systems, and utilities.
10.0	Demonstrate employability skills. The student will be able to:

	10.01 Identify documents that may be required when applying for a job.
	10.02 Complete a job application.
	10.03 Demonstrate competence in job interview techniques.
	10.04 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other persons.
	10.05 Identify acceptable work habits.
	10.06 Demonstrate acceptable employee health habits.
	10.07 Demonstrate understanding of procedures to effectively work remotely.
11.0	Demonstrate appropriate communication and coordination skills. The student will be able to:
	11.01 Write logical and understandable statements or phrases to accurately communicate in business and industry.
	11.02 Read and understand graphs, charts, diagrams and tables commonly used in this industry/occupation area.
	11.03 Read and follow written and oral instructions.
	11.04 Answer and ask questions coherently and concisely.
	11.05 Read critically by recognizing assumptions and implications and by evaluating ideas.
	11.06 Communicate effectively with technical and non-technical audiences.
	11.07 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 co-curricular 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.

Florida Department of Education
Curriculum Framework

Program Title: **Architectural Design & Construction Technology**
Career Cluster: **Architecture and Construction**

AS	
CIP Number	1604090100
Program Type	College Credit
Program Length	66 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
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 CAD draftspersons, residential and small commercial designers, plan examiners, and to help prepare students to become residential and building contractors. The program also helps to prepare students to further their education in architecture and/or construction.

The program offers courses that teach technical knowledge and skills in drafting, design, and construction needed to design and build the next generation of crafted, code compliant, healthy, comfortable, resource efficient, durable houses and buildings based on sustainable design strategies, applied building science principles, and mainstream green building practices.

The content includes but is not limited to, communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, assisting architects and architectural engineers in planning and designing structures, using construction materials, and dealing with contracts and specifications.

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

Program Structure

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

Standards

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

01.0 Demonstrate appropriate communicate skills.
02.0 Identify, select, apply and maintain drafting, drawing and graphic materials and equipment, including both table top drafting and Computer Aided Drafting (CAD).
03.0 Identify and specify appropriate construction materials and their applications.
04.0 Interpret construction drawings and documents.
05.0 Understand and apply fundamental principles of architectural and engineering design.
06.0 Interpret and apply building code regulations and product technical literature.
07.0 Produce architectural working drawings using both table top drafting and CAD.
08.0 Produce structural drawings using both table top drafting and CAD for steel and concrete structures.
09.0 Prepare subcontractor shop drawings using both table top drafting and CAD.
10.0 Survey and assess construction sites.
11.0 Estimate basic quantities of materials.
12.0 Perform office and organizational procedures.
13.0 Demonstrate appropriate math skills.
14.0 Demonstrate an appropriate understanding of building science.
15.0 Demonstrate employability skills.
16.0 Demonstrate an understanding of entrepreneurship.
17.0 Understand sustainability issues related to the design, construction and maintenance of the built environment.
18.0 Select and apply sustainable design strategies, building science principles, and green building construction best practices. (Optional)

Florida Department of Education
Student Performance Standards

Program Title: **Architectural Design & Construction Technology**
CIP Number: **1604090100**
Program Length: **66 Credit Hours**

At the completion of this program, the student will be able to:	
01.0	Demonstrate appropriate communicate skills. The student will be able to:
01.01	Identify communication channels in organizations.
01.02	Develop and use effective means of communications.
01.03	Develop an effective working relationships with others.
01.04	Prepare accurate business correspondence, memos, forms/invoices, reports, etc.
01.05	Use various electronic communication technologies and social media appropriately.
01.06	Compose clear and concise oral and written technical reports and presentations.
01.07	Participate in technical discussions and meetings.
01.08	Read and understand graphs, charts, diagrams and tables commonly used in this industry/occupation area.
01.09	Read and follow written and oral instructions.
01.10	Answer and ask questions coherently and concisely.
01.11	Read critically by recognizing assumptions and implications and by evaluating ideas.
02.0	Identify, select, apply and maintain drafting, drawing and graphic materials and equipment, including both table top drafting and Computer Aided Drafting (CAD). The student will be able to:
02.01	Use architectural and engineering scales.
02.02	Identify and select appropriate drawing materials.
02.03	Select, apply and maintain basic drawing instruments including both table top drafting tools and computer hardware devices and software programs.
02.04	Identify, apply and maintain lettering instruments.
02.05	Identify and select leads, lead holders, sharpeners and erasers for table top drafting.

	02.06 Identify, select, operate and maintain reproduction materials and equipment including plotters, laser printers, inkjet printers, blueprint machines, etc.
	02.07 Select and apply architectural and engineering curves and templates.
	02.08 Set up and maintain drafting table, T-square and parallel rule.
	02.09 Operate and maintain inking equipment and drafting materials.
	02.10 Identify, select and apply color markers and pencils.
	02.11 Identify, select and apply water base colors.
	02.12 Select and apply scribing materials and instruments.
	02.13 Operate calculators and use spreadsheets.
	02.14 Identify and use the metric system.
	02.15 Identify, maintain and operate photography equipment.
	02.16 Apply and develop drawing techniques using both table top drafting and CAD.
	02.17 Apply and develop freehand drawing and lettering techniques.
03.0	Identify and specify appropriate construction materials and their applications. The student will be able to:
	03.01 Identify and specify paving materials and applications.
	03.02 Identify and specify formwork materials and methods.
	03.03 Identify and specify concrete materials and applications.
	03.04 Identify and specify reinforcing steel and applications.
	03.05 Identify and specify masonry materials and applications.
	03.06 Identify and specify structural steel shapes, materials and applications.
	03.07 Identify and specify miscellaneous metal components and applications.
	03.08 Identify and specify wood construction materials and applications.
	03.09 Identify and specify millwork, finished carpentry, trim details, cabinets and other finish carpentry applications.
	03.10 Identify and specify adhesives and sealants and applications.

	03.11 Identify and specify plastic laminates and applications.
	03.12 Identify and specify waterproofing materials and vapor barriers and applications.
	03.13 Identify and specify insulation materials and their applications to create thermal boundaries.
	03.14 Identify and specify roofing materials and applications.
	03.15 Identify and specify flashings and applications.
	03.16 Identify and specify glazing materials for windows, doors and other openings.
	03.17 Identify and specify exterior cladding finishes and applications.
	03.18 Identify and specify floor finish materials and applications.
	03.19 Identify and specify wall finish materials and applications.
	03.20 Identify and specify ceiling finish materials and applications.
	03.21 Identify and specify fire proofing materials and applications.
	03.22 Identify and specify interior and exterior finish hardware and applications.
	03.23 Identify and specify manufactured specialty products and applications.
	03.24 Identify and specify applications of pre-engineered and prefabricated structures.
	03.25 Identify and specify common plumbing components.
	03.26 Identify and specify Heating, Ventilation and Air-Conditioning (HVAC) equipment and components.
	03.27 Identify and specify common electrical components.
04.0	Interpret construction drawings and documents. The student will be able to:
	04.01 Interpret technical symbols.
	04.02 Interpret topographical drawings.
	04.03 Interpret aerial photographs and maps.
	04.04 Interpret site drawings.
	04.05 Interpret architectural drawings.

	04.06 Interpret written specifications.
	04.07 Interpret addendums.
	04.08 Interpret notice of change and change orders.
	04.09 Interpret shop drawings.
	04.10 Interpret structural drawings.
	04.11 Interpret mechanical drawings.
	04.12 Interpret electrical drawings.
	04.13 Interpret modular design strategies and constructability of buildings.
	04.14 Identify and interpret design and construction contracts and agreements.
	04.15 Identify and interpret lien waivers.
	04.16 Interpret property deeds.
	04.17 Interpret development plans and documents.
05.0	Understand and apply fundamental principles of architectural and engineering design. The student will be able to:
	05.01 Understand a concrete slump test.
	05.02 Understand concrete cylinder compression tests.
	05.03 Understand soil analysis reports.
	05.04 Understand compaction tests and reports.
	05.05 Understand live and dead load designs.
	05.06 Determine effect of loads on materials.
	05.07 Understand expansion and contraction principles of various building materials and control strategies.
	05.08 Understand the fundamentals of building site requirements.
	05.09 Determine and apply space relationships.
06.0	Interpret and apply building code regulations and product technical literature. The student will be able to:

	06.01 Use appropriate time-saving reference materials.
	06.02 Interpret and apply state and national building codes, in-particular the International Building Codes (IBC), and Florida Building codes.
	06.03 Interpret and apply local municipal codes and regulations.
	06.04 Interpret zoning bylaws and regulations.
	06.05 Interpret zoning maps.
	06.06 Read building and architectural trade magazines and catalogs.
	06.07 Apply regional building estimating costs.
	06.08 Be aware of local, regional and state building and architectural association's current legislative regulations.
07.0	Produce architectural working drawings using both table top drafting and CAD. The student will be able to:
	07.01 Prepare floor plan drawings.
	07.02 Prepare foundation plan and detail drawings.
	07.03 Prepare elevation drawings.
	07.04 Prepare landscape layouts.
	07.05 Prepare material and product schedules.
	07.06 Prepare section drawings.
	07.07 Build architectural models.
	07.08 Prepare truss drawings.
	07.09 Prepare stairway drawings.
	07.10 Prepare fireplace drawings.
	07.11 Prepare plot and site plan drawings.
08.0	Produce structural drawings using both table top drafting and CAD for steel and concrete structures. The student will be able to:
	08.01 Draw beam connections.
	08.02 Draw structural assemblies.

	08.03 Make material quantity take-offs from reinforced concrete engineering drawings.
	08.04 Prepare footing and foundation drawings.
	08.05 Prepare column detail drawings.
	08.06 Prepare floor and roof detail drawings.
	08.07 Prepare special structure detail drawings.
	08.08 Prepare framed beam connection drawings.
	08.09 Prepare bolted column detail drawings.
09.0	Prepare subcontractor shop drawings using both table top drafting and CAD. The student will be able to:
	09.01 Prepare plumbing fixture and appliance layout plan drawings.
	09.02 Prepare thermal building enclosure construction drawings that include insulation and air barrier details.
	09.03 Prepare electrical plan drawings.
10.0	Survey and assess construction sites. The student will be able to:
	10.01 Prepare site assessment sketches and document with photographs.
	10.02 Layout a building foundation on a building site.
	10.03 Use levels and field rods when surveying property.
	10.04 Use a transit, builder’s level and laser level to layout a building foundation.
	10.05 Interpret angular and distance measurements to bearings and azimuth. (Optional)
	10.06 Use the Pythagorean theorem when laying out a building.
	10.07 Assess a piece of property to determine the type of foundation best suited for the building site.
11.0	Estimate basic quantities of materials. The student will be able to:
	11.01 Compute area and volume of buildings.
	11.02 Estimate quantities of excavation and fill.
	11.03 Take off quantities of form work.

	11.04 Take off quantities of concrete.
	11.05 Take off quantities of lumber.
	11.06 Take off quantities of masonry.
	11.07 Interpret and complete standard estimator's form.
	11.08 Apply the use of computer estimating software.
	11.09 Understand and create construction budgets.
12.0	Perform office and organizational procedures. The student will be able to:
	12.01 Organize and maintain personal work area.
	12.02 Operate office equipment.
	12.03 Estimate, order and maintain office and drafting supplies.
	12.04 Maintain drawing file systems.
	12.05 Maintain record of building costs.
	12.06 Develop and maintain technical reference library.
	12.07 Understand the variety of construction and project management systems.
	12.08 Use project management and scheduling software.
13.0	Demonstrate appropriate math skills. The student will be able to:
	13.01 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares and cylinders.
	13.02 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
	13.03 Add, subtract, multiply and divide using fractions, decimals and whole numbers.
	13.04 Determine the correct purchase price, to include sales tax for a quantity of materials.
	13.05 Demonstrate an understanding of federal, state and local taxes and their computation.
14.0	Demonstrate an appropriate understanding of building science. The student will be able to:
	14.01 Understand heat, air and moisture flows related to building enclosures, and their performance, as a system.

	14.02 Understand benefits of properly designed and constructed vs consequences of poorly designed and constructed..
	14.03 Understand various pressure measurements used in testing buildings and their components for performance, such as Pounds per Square Inch (PSI), Cubic Feet per Minute (CFM) and Kilopascal (KPA).
15.0	Demonstrate employability skills--The student will be able to:
	15.01 Conduct a job search.
	15.02 Secure information about a job.
	15.03 Identify documents which may be required when applying for a job interview and create a portfolio.
	15.04 Write a resume, cover letter and fill out a typical job application form.
	15.05 Demonstrate competence in job interview techniques.
	15.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
	15.07 Exhibit/Build productive work habits.
	15.08 Demonstrate knowledge of how to make job changes appropriately.
	15.09 Demonstrate acceptable personal hygiene.
16.0	Demonstrate an understanding of entrepreneurship. The student will be able to:
	16.01 Describe entrepreneurship.
	16.02 Describe the importance of entrepreneurship and small business ownership to the American economy.
	16.03 List the advantages and disadvantages of business ownership.
	16.04 Identify the risks involved in ownership of a business.
	16.05 Identify the necessary personal characteristics of a successful entrepreneur.
	16.06 Identify the business skills needed to operate a small business efficiently and effectively.
17.0	Understand sustainability issues related to the design, construction and maintenance of the built environment. The student will be able to:
	17.01 Describe the impact of the construction industry on the natural environment.
	17.02 Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.
	17.03 Identify and analyze sustainable alternatives to conventional construction practices.

	17.04	Identify specific design and construction principles, practices and strategies that lessen adverse impacts on the natural environment.
	17.05	Know various building design and construction energy analysis tools and software that help to determine the buildings performance before it is constructed.
	17.06	Identify design features, appropriate construction details and maintenance practices that contribute to a project's overall sustainability.
	17.07	Identify health related problems which may result from exposure to work related chemicals and hazardous materials and know the proper precautions required for handling such materials.
18.0	Select and apply sustainable design strategies, building science principles, and green building construction best practices. - The student will be able to:	
	18.01	Define sustainability as it relates to designing durable, resilient buildings.
	18.02	Select and apply sustainable design strategies to design and/or construct buildings.
	18.03	Define building science.
	18.04	Select and apply current building science principles to design and/or construct buildings.
	18.05	Define green building.
	18.06	Select and apply green building construction practices when designing and/or constructing a building.
	18.07	Select and apply third party (green, energy, water, and IAQ) certification guidelines or requirements when designing and/or constructing a building.

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.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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 Certificates:

Sustainable Design (0630330106) – 19 Credit Hours

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

Florida Department of Education
Curriculum Framework

Program Title: **Building Construction Technology**
Career Cluster: **Architecture and Construction**

AS	
CIP Number	1615100102
Program Type	College Credit
Program Length	60 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
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 a construction field superintendent, construction manager, facility management supervisor, specialty contractor or residential/ small commercial builder 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 communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, construction practices, building codes, blueprint reading, personnel and resource management skills, safety, site selection and planning and building residential and commercial structures.

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

Program Structure

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

Standards

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

01.0 Communicate effectively.
02.0 Identify appropriate grade, quality, use, and selection of building materials, and methods of construction.
03.0 Draw, read and interpret drawings and specifications.
04.0 Apply laws, codes, regulations and contract documents.
05.0 Survey and investigate construction sites.
06.0 Select and maintain construction site tools and equipment.
07.0 Interpret basic designs and apply sound construction principles.
08.0 Understand take off quantities and estimate costs.
09.0 Plan, coordinate, schedule and control projects.
10.0 Understand various tests and inspections.
11.0 Select, train and supervise personnel.
12.0 Demonstrate efficient office and administrative procedures.
13.0 Demonstrate appropriate math skills.
14.0 Demonstrate an understanding of basic science.
15.0 Demonstrate employability skills.
16.0 Demonstrate an understanding of entrepreneurship.
17.0 Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.

Florida Department of Education
Student Performance Standards

Program Title: **Building Construction Technology**
CIP Number: **1615100102**
Program Length: **60 Credit Hours**

At the completion of this program, the student will be able to:	
01.0	Communicate effectively. The student will be able to:
01.01	Understand federal and state laws applicable to the construction industry.
01.02	Prepare business correspondence.
01.03	Prepare daily project report.
01.04	Prepare requisitions for equipment and materials.
01.05	Prepare minutes from job-site meetings.
01.06	Write logical and understandable statements or phrases to accurately fill out forms and invoices commonly used in business and industry.
01.07	Read and understand graphs, charts, diagrams and tables commonly used in this industry/occupation area.
01.08	Read and follow written and oral instructions.
01.09	Answer and ask questions coherently and concisely.
01.10	Demonstrate appropriate oral and written communication skills (i.e., in-person, phone, email, social media and text messaging).
01.11	Demonstrate leadership skills.
01.12	Prepare and deliver a presentation on project status/updates.
01.13	Select appropriate job specific attire.
01.14	Know how to prioritize communication in hazardous situations.
02.0	Identify appropriate grade, quality, use and selection of building materials and methods of construction. The student will be able to:
02.01	Identify structural materials, assemblies and finishes.
02.02	Identify mechanical, plumbing and electrical components and equipment.

03.0	Draw, read and interpret drawings and specifications. The student will be able to:
03.01	Identify, select and use manual and/or digital drafting instruments.
03.02	Identify architectural symbols.
03.03	Take site notes and measurements.
03.04	Identify electrical symbols.
03.05	Identify mechanical symbols.
03.06	Identify topographical and site symbols.
03.07	Interpret land surveyor's notes.
03.08	Read and understand topographic drawings.
03.09	Prepare working sketches and "as-built" drawings.
03.10	Interpret architectural drawings and specifications.
03.11	Read hardware, window, door, finish and furniture schedules.
03.12	Interpret structural drawings and specifications.
03.13	Interpret reinforcing steel drawings and bar list and placement.
03.14	Verify compliance with ASTM (American Society for Testing and Materials) standards.
03.15	Evaluate shop drawings prior to review by architect or engineer of record.
03.16	Interpret mechanical drawings and specifications.
03.17	Interpret electrical drawings and specifications.
03.18	Interpret and apply floor, wall and roof framing construction details found in the construction drawings, and in the written specifications used to construct a residential or small commercial building.
04.0	Apply laws, codes, regulations and contract documents. The student will be able to:
04.01	Apply federal and state safety codes.
04.02	Interpret pre-qualification documents.
04.03	Develop a general understanding of bonding and insurance.

	04.04 Interpret, apply and control change orders.
	04.05 Interpret and apply the International Residential Code (IRC), International Building Code (IBC) and International Energy Conservation Code (IECC) building codes.
	04.06 Understand worker's compensation requirements.
	04.07 Compile a complete set of contract documents.
	04.08 Understand the Construction Lien Act.
05.0	Survey and investigate construction sites. The student will be able to:
	05.01 Understand how to lay out and measure a site.
	05.02 Use surveying instruments, such as a transit, site level and/or laser level to determine finish floor elevations and establish building benchmarks.
	05.03 Evaluate the site and existing infrastructure for needs required.
	05.04 Read reports from a geotechnical engineer.
06.0	Select and maintain construction site tools and equipment. The student will be able to:
	06.01 Select and maintain jobsite safety and fire equipment.
	06.02 Select cleaning equipment and products.
	06.03 Select construction equipment and tools required for a specific project.
	06.04 Select, properly use and maintain shop and power tools.
07.0	Interpret basic designs and apply construction principles. The student will be able to:
	07.01 Plan and coordinate site clearing, preparation, excavation and foundation work.
	07.02 Coordinate concrete and formwork.
	07.03 Coordinate staging and scaffolding.
	07.04 Coordinate the erection of walls with the rough opening sizes for windows and doors.
	07.05 Coordinate masonry work.
	07.06 Coordinate the proper selection and installation of various roofing materials.

07.07	Coordinate the selections and installations of miscellaneous metal.
07.08	Coordinate structural steel work.
07.09	Coordinate mechanical work.
07.10	Coordinate elevator installation.
07.11	Coordinate electrical and lighting installation.
07.12	Coordinate the installation of lath, plaster and dry wall.
07.13	Coordinate painting and finishes.
07.14	Coordinate the installation tile and terrazzo.
07.15	Coordinate the installation of finish flooring.
07.16	Coordinate the installation of rough and finish carpentry.
07.17	Understand energy efficiency, water efficiency, indoor air quality, green building state and national guidelines and certification requirements, and implement and monitor these guidelines to achieve these various certifications.
07.18	Understand appropriate alternative and renewable energy systems.
07.19	Understand appropriate climate specific building materials, systems and technologies.
07.20	Apply current building science principles to the construction of residential and small commercial buildings.
07.21	Apply sustainable design strategies to the construction of green built houses and small commercial buildings.
08.0	Understand take off quantities and estimate costs. The student will be able to:
08.01	Make mathematical and geometrical calculations.
08.02	Estimate quantities of construction materials.
08.03	Compile lists of sub-trades for project.
08.04	Analyze and project labor unit costs.
08.05	Analyze and project site overhead costs.
08.06	Evaluate sub trade bids.
08.07	Summarize project cost and complete tenders prices.

	08.08 Determine testing requirements based on architectural and engineering plans and specifications.
09.0	Plan, coordinate, schedule and control projects. The student will be able to:
	09.01 Prepare daily time sheets and daily logs.
	09.02 Record and control materials received.
	09.03 Allocate efficient use of site space.
	09.04 Maintain a clean and orderly construction site.
	09.05 Understand the handling and storage requirements of different materials and equipment for loss prevention and jobsite safety.
	09.06 Coordinate and control use of construction tools and equipment.
	09.07 Develop a schedule of values and prepare progress billing.
	09.08 Prepare work schedules.
	09.09 Prepare material delivery schedules.
	09.10 Expedite delivery of manufactured materials.
	09.11 Analyze productivity.
	09.12 Record deficiencies as a result of project inspections.
	09.13 Prepare coded cost break downs.
	09.14 Take appropriate action to correct project deficiencies.
	09.15 Monitor schedule to control project.
	09.16 Prepare cost reports.
10.0	Understand various tests and inspections. The student will be able to:
	10.01 Understand a concrete slump test.
	10.02 Understand what tests are required for a particular construction type.
	10.03 Know when to call building inspection department for signoff on required phases of construction permit progress.
	10.04 Know when to call third party verifiers to test and/or verify compliance at required phases or stages of construction for certifications.

11.0	Select, train and supervise personnel. The student will be able to:
11.01	Understand the importance of training in Cardiopulmonary Resuscitation (CPR), first aid and Automatic External Defibrillator (AED).
11.02	Instruct new employee on company safety regulations.
11.03	Interpret and adhere to basic company policies.
11.04	Select and hire employees.
11.05	Interview and evaluate prospective employees.
11.06	Evaluate employee performance.
12.0	Demonstrate efficient office and administrative procedures. The student will be able to:
12.01	Organize the office and field work areas.
12.02	Select and use appropriate forms and computer software.
12.03	Develop and maintain a filing system.
12.04	Maintain an inventory of physical assets.
12.05	Set up and maintain a technical reference library.
12.06	Maintain a system for field work authorizations.
12.07	Maintain a system for back charges and change orders.
12.08	Interpret basic company accounting procedures.
13.0	Demonstrate appropriate math skills. The student will be able to:
13.01	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares and cylinders.
13.02	Measure tolerances on horizontal and vertical surfaces using Metric and/or English units.
13.03	Add, subtract, multiply and divide using fractions, decimals and whole numbers.
13.04	Determine the correct purchase price, to include sales tax, for a materials list containing a minimum of six items.
13.05	Demonstrate an understanding of federal, state and local taxes and their computation.
13.06	Understand unemployment, worker's compensation, retirement benefits, vacation benefits, short and long term disabilities, military leave, maternity leave, health insurance and other costs and benefits for employees and the employer.

14.0	Demonstrate an understanding of basic science. The student will be able to:
14.01	Understand material behavior as a result of temperature extremes, chemical reaction, moisture content, etc.
14.02	Draw conclusions or make inferences from data.
14.03	Identify potential health problems related to chemicals and hazardous materials and know the proper precautions required for handling such materials.
14.04	Understand pressure measurement in terms of Pounds per Square Inch (PSI).
15.0	Demonstrate employability skills. The student will be able to:
15.01	Understand the process of conducting a job search for employment.
15.02	Secure information about a job.
15.03	Obtain and compile documents which may be required when applying for a job interview.
15.04	Complete and submit a job application.
15.05	Demonstrate competence in job interview techniques.
15.06	Identify or demonstrate appropriate responses to criticism in the workplace.
15.07	Identify good work habits.
16.0	Demonstrate an understanding of entrepreneurship. The student will be able to:
16.01	Define entrepreneurship.
16.02	Describe the importance of entrepreneurship to the American economy.
16.03	List the advantages and disadvantages of business ownership.
16.04	Identify the risks involved in ownership of a business.
16.05	Explain the various types of company structure (i.e., limited liability corporation, corporation, sole proprietorship, etc.).
16.06	Identify the necessary personal characteristics of a successful entrepreneur.
16.07	Identify the business skills needed to operate a small business efficiently and effectively.
17.0	Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:

17.01	Comply with all applicable Occupational Safety and Health Administration (OSHA) rules and regulations.
17.02	Identify and locate the Safety Data Sheets (SDS), formerly referred to as Material Safety Data Sheets (MSDS), and follow the procedures as necessary.
17.03	Describe the "Right-to-Understand" law as recorded in (29 CFR-1910.1200).
17.04	Identify and use safety equipment and tools correctly.
17.05	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
17.06	Explain emergency procedures to follow in response to workplace accidents.
17.07	Create a disaster and/or emergency response plan.

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.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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 as identified on the secondary student's Individual Educational Plan (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 counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

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

Building Construction Specialist (0615100103) – 18 Credit Hours

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

Florida Department of Education
Curriculum Framework

Program Title: **Computer-Aided Drafting and Design**
Career Cluster: **Architecture and Construction**

AS	
CIP Number	1615130202
Program Type	College Credit
Program Length	60 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
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 architectural, civil, surveying, structural, and/or mechanical CAD/CAM draftspersons, plans examiners, design drafters, and for further career advancement in the design, construction and manufacturing industries.

This program offers courses that provides technical knowledge and skills needed to prepare for further education and careers in the architecture, construction, civil, surveying, structural and mechanical drafting industry. Program content prepares students to create detailed drawings for builders and manufacturers to construct and produce products.

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

Program Structure

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

Standards

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

01.0 Apply fundamental drafting skills.
02.0 Prepare Computer-Aided Drafting (CAD) drawings.
03.0 Prepare mechanical drawings.
04.0 Prepare electrical/electronic drawings. (Optional)
05.0 Prepare civil engineering drawings.
06.0 Prepare Architectural, Engineering and Construction (AEC) drawings.
07.0 Apply technical mathematics.
08.0 Demonstrate appropriate communication and coordination skills.
09.0 Demonstrate employability and soft skills.
10.0 Demonstrate an understanding of entrepreneurship. (Optional)

Florida Department of Education
Student Performance Standards

Program Title: **Computer-Aided Drafting and Design**
CIP Number: **1615130202**
Program Length: **60 Credit Hours**

At the completion of this program, the student will be able to:	
01.0	Apply fundamental drafting skills. The student will be able to:
01.01	Operate drafting instruments.
01.02	Perform lettering techniques.
01.03	Prepare multi-view drawings.
01.04	Prepare section and detail drawings.
01.05	Prepare supplemental auxiliary views.
01.06	Prepare dimension drawings.
01.07	Prepare pictorial drawings (e.g., isometric, perspectives, etc.).
01.08	Prepare sketches and/or renderings.
01.09	Prepare title blocks, borders, general notes, symbols, abbreviations, and legends.
01.10	Compile a portfolio of drawings and/or other works.
02.0	Prepare Computer-Aided Drafting (CAD) drawings. The student will be able to:
02.01	Utilize a graphical user interface.
02.02	Perform standard drafting procedures.
02.03	Operate peripheral equipment, such as printers, plotters, scanners, etc.
02.04	Apply CAD drawing standards as established and updated by the industry.
02.05	Construct various geometric figures of lines and shapes.
02.06	Create and edit text using appropriate style and size to annotate drawings.

	02.07 Use and control accuracy-enhancement tools for entity-positioning methods, such as snap, XYZ and coordinate systems.
	02.08 Identify, create, store, and use standard part symbols and libraries.
	02.09 Use editing commands to modify objects.
	02.10 Control entity properties by layer (i.e., color, line type and line weight).
	02.11 Use viewing commands to perform zooming and panning.
	02.12 Plot drawings on media using layout and scale.
	02.13 Use query commands to access the database for entity characteristics, distance, area and status.
	02.14 Apply standard dimensioning rules.
	02.15 Export CAD drawings to web format.
	02.16 Demonstrate an understanding of point sources in 3-D.
	02.17 Apply Computer-Aided Modeling.
	02.18 Demonstrate a fundamental understanding of Building Information Modeling (BIM).
	02.19 Apply specialized CAD functions, such as 3-Dimensional (3D) modeling, CAD rendering, CNC milling, etc. (Optional)
03.0	Prepare mechanical drawings. The student will be able to:
	03.01 Prepare fastener drawings.
	03.02 Prepare assembly drawings.
	03.03 Prepare detail and section drawings.
	03.04 Prepare technical drawings.
	03.05 Prepare spring drawings.
	03.06 Prepare casting drawings.
	03.07 Prepare computer-aided drawings.
	03.08 Prepare material specifications and parts list.
	03.09 Identify geometric tolerances and dimensioning of specific machined surfaces.

	03.10 Prepare cam drawings. (Optional)
	03.11 Prepare gear drawings. (Optional)
	03.12 Prepare welding drawings. (Optional)
	03.13 Prepare bearing drawings. (Optional)
	03.14 Prepare forging drawings (Optional)
	03.15 Prepare tool drawings. (Optional)
	03.16 Prepare molding diagrams. (Optional)
	03.17 Prepare stamping drawings. (Optional)
	03.18 Prepare numerical-control drawings. (Optional)
04.0	Prepare electrical/electronic drawings. (Optional) The student will be able to:
	04.01 Prepare electrical circuit schematic drawings.
	04.02 Prepare printed circuit board assembly drawing packages.
	04.03 Prepare connection and interconnection drawings.
	04.04 Prepare wiring drawings.
	04.05 Prepare cable drawings and/or harness drawings.
	04.06 Prepare component drawings.
	04.07 Prepare logic diagrams.
05.0	Prepare civil engineering drawings. The student will be able to:
	05.01 Apply drafting techniques.
	05.02 Apply surveying fundamentals.
	05.03 Demonstrate a basic knowledge of Geographic Information Systems (GIS).
	05.04 Demonstrate an understanding of Global Positioning Systems (GPS).
	05.05 Demonstrate an understanding of and apply mapping scales.

	05.06 Read and interpret legal descriptions and plot plans.
	05.07 Read, interpret and draw contour lines.
	05.08 Draw profiles and cross sections.
	05.09 Draw roadway and/or street layouts.
	05.10 Calculate earth work volumes and quantity take-offs.
	05.11 Create cut and fill earth work drawing.
	05.12 Demonstrate an understanding of curve data.
	05.13 Demonstrate an understanding of parcels.
	05.14 Demonstrate an understanding of surfaces.
	05.15 Draw boundary lines using bearing angles and distances.
06.0	Prepare Architectural, Engineering and Construction (AEC) drawings. The student will be able to:
	06.01 Prepare floor plan drawings.
	06.02 Prepare foundation plan.
	06.03 Prepare elevation drawings.
	06.04 Prepare schedules.
	06.05 Prepare sections and detail drawings.
	06.06 Build architectural models.
	06.07 Prepare plot and site plan drawings.
	06.08 Create basic structural drawings and detailing conventions.
	06.09 Demonstrate an understanding of construction materials, methods and techniques.
	06.10 Develop a virtual building model using BIM software.
	06.11 Prepare drawing sheets from a BIM model.
	06.12 Prepare landscape layouts. (Optional)

	06.13 Prepare wood roof framing plan. (Optional)
	06.14 Prepare stairway drawings. (Optional)
	06.15 Prepare fireplace drawings. (Optional)
	06.16 Prepare plumbing fixture layout drawings. (Optional)
	06.17 Prepare Heating, Ventilation and Air-Conditioning (HVAC) equipment layout drawings. (Optional)
	06.18 Prepare residential electrical plan drawings. (Optional)
	06.19 Prepare perspective and isometric drawings. (Optional)
	06.20 Develop a computational design algorithm. (Optional)
07.0	Apply technical mathematics. The student will be able to:
	07.01 Solve arithmetic problems.
	07.02 Solve algebra problems.
	07.03 Solve trigonometry problems.
	07.04 Solve geometry problems.
	07.05 Solve surveying problems. (Optional)
08.0	Demonstrate appropriate communication and coordination skills. The student will be able to:
	08.01 Write logical and understandable statements or phrases to accurately fill out forms/invoices commonly used in business & industry.
	08.02 Read and understand graphs, charts, diagrams and tables commonly used in this industry/occupation area.
	08.03 Read and follow written and oral instructions.
	08.04 Answer and ask questions coherently and concisely.
	08.05 Read critically by recognizing assumptions and implications and by evaluating ideas.
	08.06 Communicate effectively with technical and non-technical audiences.
	08.07 Demonstrate the ability to distinguish between different disciplines (e.g., architectural, mechanical, structural, construction, etc.) and read and interpret various drawings.
09.0	Demonstrate employability and soft skills. The student will be able to:

	09.01 Conduct a job search.
	09.02 Obtain information about a job.
	09.03 Prepare documents that may be required when applying for a job.
	09.04 Complete a job application form correctly.
	09.05 Demonstrate competence in job interview techniques.
	09.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other employees.
	09.07 Exhibit acceptable work habits and the ability to work remotely.
	09.08 Demonstrate knowledge of how to make job changes appropriately.
	09.09 Demonstrate acceptable employee health habits.
	09.10 Act in a professional manner.
	09.11 Prepare a work portfolio and resume.
10.0	Demonstrate an understanding of entrepreneurship. (Optional) The student will be able to:
	10.01 Describe entrepreneurship.
	10.02 Describe the importance of entrepreneurship to the American economy.
	10.03 List the benefits of various types of business ownership in order to recognize Sole Proprietorships, Partnerships and Corporations (including Limited Liability Corporations and S-Corporations).
	10.04 Identify the risks involved in ownership of a business.
	10.05 Identify the necessary personal characteristics of a successful entrepreneur.
	10.06 Identify the business skills needed to operate a small business.

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.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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 Certificates:

Computer-Aided Design Technical Certificate (0615130204) – 14 Credit Hours
Advanced Computer-Aided Design Technical Certificate (0615130200) – 22 Credit Hours

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

Florida Department of Education
Curriculum Framework

Program Title: **Construction Management Technology**
Career Cluster: **Architecture and Construction**

AS	
CIP Number	1646041201
Program Type	College Credit
Program Length	60 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
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 Construction Project Manager/Engineer, Estimator, Superintendent, Scheduler, Expeditor, or Purchasing Agent

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 communication skills, leadership skills, human relations, employability skills, safe and efficient work practices, project planning and design, using construction materials, dealing with contracts and specifications.

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

Program Structure

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

Standards

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

01.0 Demonstrate effective communication, both orally and in writing.
02.0 Interpret drawings and documents.
03.0 Demonstrate knowledge of materials and methods of construction.
04.0 Recognize basic safety hazards on a construction site and standard prevention measures.
05.0 Interpret and apply basic principles of Architectural Engineering and Design.
06.0 Reference and understand codes, regulations and technical literature.
07.0 Survey and assess construction sites.
08.0 Estimate basic quantities and costs for the bidding process in a construction project.
09.0 Perform office and administrative procedures.
10.0 Discuss basic principles of ethics in the construction industry.
11.0 Demonstrate appropriate math skills.
12.0 Demonstrate appropriate understanding of basic science.
13.0 Demonstrate employability skills.
14.0 Demonstrate a basic understanding of entrepreneurship.
15.0 Schedule and coordinate work sequence.
16.0 Learn to effectively manage a workforce.
17.0 Learn to effectively “buy out” a project as required.
18.0 Demonstrate the ability to use current technology related to the construction process.

Florida Department of Education
Student Performance Standards

Program Title: **Construction Management Technology**
CIP Numbers: **1646041201**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Demonstrate effective communication, both orally and in writing. The student will be able to:
01.01	Demonstrate how to sketch basic plan details in order to communicate with subcontractors and other professionals.
01.02	Create written communications appropriate to the construction discipline.
01.03	Understand appropriate communication channels for construction projects.
01.04	Utilize understandable means of oral communication appropriate to the construction discipline.
01.05	Develop effective working relationships with others.
01.06	Prepare business correspondence, memos and reports.
01.07	Compose clear and concise oral and written reports and presentations appropriate for construction projects.
01.08	Participate in technical discussions and meetings.
01.09	Read and understand construction document blueprints and associated drawings, graphs, charts, diagrams and tables commonly used in construction projects.
01.10	Utilize appropriate discussion, negotiation, conflict resolution and cooperation skills to work with people from a variety of experiences and backgrounds to promote learning in class activities and group work.
02.0	Interpret drawings and documents. The student will be able to:
02.01	Interpret technical symbols.
02.02	Interpret topographical drawings.
02.03	Interpret aerial photographs and maps.
02.04	Interpret civil, site and survey drawings.
02.05	Interpret architectural, structural, mechanical, electrical and plumbing drawings.
02.06	Interpret specifications (specs), relating specs to the construction drawings.

	02.07 Interpret addendums.
	02.08 Interpret notice of change and change orders.
	02.09 Interpret submittal documents, including shop drawings, material data, samples and product data.
	02.10 Interpret modular approach to buildings.
	02.11 Understand the common types of contracts utilized in the construction industry.
	02.12 Understand the purpose and process of construction mechanical liens and partial and final lien waivers.
	02.13 Analyze construction documents for various project management tasks such as the preparation of schedules, estimates, constructability, safety, risk, etc.
03.0	Demonstrate knowledge of materials and methods of construction. The student will be able to:
	03.01 Understand the materials and methods of construction identified with the Construction Specification Institute format: Bidding Documents; General Conditions; Site Work; Concrete; Masonry; Metals; Wood; Thermal and Moisture; Doors and Hardware; Finishes; Specialties; Equipment; Furnishings; Special Construction; Conveying System; Mechanical; and Electrical.
	03.02 Examine construction techniques associated with wood, steel, masonry and reinforced concrete framing systems, roof systems, and interior and exterior finishes.
	03.03 Understand the properties, mechanical tests and quality control tests of common construction materials and their behaviors under different environments, short- or long-term.
	03.04 Understand appropriateness and sustainability of materials for construction projects.
	03.05 Understand the applications of common construction equipment for hoisting materials, erecting structures and earth-moving.
	03.06 Demonstrate the use of a tape measure, levels and other construction tools to verify work in place (check wall layouts, square corners, unit heights, Americans with Disabilities Act compliance, basic plan dimensions, etc.).
	03.07 Understand the basic principles of soil mechanics including soil classification, soil compaction, soil testing and reading soil borehole logs.
	03.08 Understand how to develop a construction logistics plan (parking and access routes, storage areas, project limit fencing, etc.).
	03.09 Relate the sequence of construction activities and importance of safety and constructability issues.
	03.10 Reference and interpret information from building codes and standards.
	03.11 Understand how to interact with local building officials and inspectors.
04.0	Recognize basic safety hazards on a construction site and standard prevention measures. The student will be able to:
	04.01 Evaluate a construction project to assure a safe working environment

	04.02 Reference and interpret Occupational Safety and Health Administration (OSHA) standards related to construction hazards.
	04.03 Visually recognize compliance and non-compliance issues and situations, related to OSHA standards.
	04.04 Review summaries that reflect current accident causes and discuss violations, preventive measures and ethical issues.
	04.05 Understand how to give presentations related to construction safety hazards and jobsite toolbox meetings.
	04.06 Identify health related problems which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
05.0	Interpret and apply basic principles of Architectural Engineering and Design. The student will be able to:
	05.01 Conduct and interpret concrete slump tests.
	05.02 Understand ASTM standards for concrete specimen collection and testing and how to interpret the results.
	05.03 Understand the use, function and importance of all the standard construction materials testing (Limerock Bearning Ratio, borings, compaction, slump, cylinders, duct pressure, etc.).
	05.04 Demonstrate a general understanding of the commissioning process.
	05.05 Have a basic understanding of all the major Heating, Ventilation and Air Conditioning (HVAC) systems: CW, HHW, Dx, Pkg Units, VRF, etc., and include a general overview of how each one works.
	05.06 Interpret soil analysis reports.
	05.07 Interpret compaction test reports.
	05.08 Determine the effect of loads on materials.
	05.09 Interpret the principles of expansion, contraction and control.
	05.10 Interpret and apply the fundamentals of acceptable site development requirements.
	05.11 Demonstrate a basic understanding of building space relationships.
	05.12 Understand the basic principles of structural loads and stresses in existing buildings and new construction.
	05.13 Identify the basic elements of mechanical, electrical, plumbing and HVAC systems.
	05.14 Understand the functional interrelationships and positioning of mechanical, electrical, plumbing and HVAC systems in relation to the overall project.
06.0	Reference and understand codes, regulations and technical literature. The student will be able to:
	06.01 Reference and understand the basic elements of the International Building Code or the Florida Building Code.

	06.02 Reference and understand the basic elements of municipal codes and regulations.
	06.03 Identify and understand trade manuals, magazines and catalogs.
	06.04 Understand the permitting processes by various jurisdictions/agencies and how to follow instructions to properly and accurately assemble and submit the required documentation (i.e., making sure the check sheet is complete).
07.0	Survey and assess construction sites. The student will be able to:
	07.01 Understand and use measuring tapes and chains or other measuring devices.
	07.02 Prepare site sketches.
	07.03 Apply methods of site measuring.
	07.04 Interpret survey books and logs.
	07.05 Identify and apply basic principles of levels and rods.
	07.06 Interpret angular and distance measurements to bearings and azimuth.
	07.07 Demonstrate a basic understanding of site meetings and site inspections.
	07.08 Apply basic surveying techniques for construction activities.
	07.09 Use the transit and level to establish the correct horizontal and vertical placement of construction elements.
	07.10 Understand the use of modern surveying equipment in the construction industry (Total Station, GPS, etc.).
08.0	Estimate basic quantities and costs for the bidding process in a construction project. The student will be able to:
	08.01 Compute area and volume calculations.
	08.02 Estimate quantities of excavation and fill.
	08.03 Estimate take off quantities of form work.
	08.04 Estimate take off quantities of concrete.
	08.05 Estimate take off quantities of timber.
	08.06 Estimate take off quantities of masonry, mortar and rebar/reinforcing.
	08.07 Interpret and complete standard estimator forms.
	08.08 Recognize different types of estimates and their uses.

	08.09 Perform quantity takeoffs based on the contract documents and generate detailed estimates.
	08.10 Determine labor and equipment costs.
	08.11 Understand the use of construction cost databases.
	08.12 Understand the scope of subcontractor work, solicit quotations and bids for procurement of products and services, develop the evaluation criteria and select a candidate.
	08.13 Understand how to prepare a formal bid package.
	08.14 Use computer technologies to assist with the preparation of estimates.
09.0	Perform office and administrative procedures. The student will be able to:
	09.01 Understand how to maintain a record of building costs.
	09.02 Analyze current project costs and develop projections for future costs (i.e., complete a project cost report).
	09.03 Understand how to develop and maintain a technical reference library.
	09.04 Demonstrate an understanding of basic project management software systems and plans.
	09.05 Understand the project engineer's function on the jobsite with respect to construction documentation and the review of submittals and shop drawings.
	09.06 Understand how to schedule and purchase materials and equipment.
	09.07 Demonstrate how to maintain and update the contract documents, the "working set" of the plans and specs, during construction. • Make sure all plan sheets are current. • Ensure RFI's, ASI's, FO's are properly noted. • Notate field modifications. • Ensure sub-contractors and suppliers have the most current docs.
	09.08 Understand how to turn "working set" into "as-builts" at the end of the project.
	09.09 Prepare and maintain Request for Information (RFI), correspondence and submittal logs.
	09.10 Develop a submittal log based on the requirements of the specs book.
10.0	Discuss basic principles of ethics in the construction industry. The student will be able to:
	10.01 Identify ethical issues in construction.
	10.02 Demonstrate an understanding of professional and ethical responsibilities.

11.0	Demonstrate appropriate math skills--The student will be able to:
11.01	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares and cylinders.
11.02	Demonstrate application of applied mathematics (geometry, basic trigonometry, or statistics) to a variety of applied technical problems.
11.03	Understand the basic principles of accounting as needed for construction projects and in the construction industry.
12.0	Demonstrate appropriate understanding of basic science. The student will be able to:
12.01	Demonstrate basic understanding of the scientific method.
12.02	Demonstrate basic understanding of instrumentation and measurement.
12.03	Demonstrate basic understanding in at least one science area to include environmental, earth, physical or chemical sciences.
13.0	Demonstrate employability skills. The student will be able to:
13.01	Conduct a thorough job search.
13.02	Identify documents which may be required when applying for a job interview.
13.03	Create an effective resume.
13.04	Demonstrate competence in job interview techniques.
13.05	Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
13.06	Identify acceptable work habits.
13.07	Demonstrate knowledge of how to make job changes appropriately.
14.0	Demonstrate a basic understanding of entrepreneurship. The student will be able to:
14.01	Define the basic principles of entrepreneurship.
14.02	Understand the advantages and disadvantages of business ownership.
14.03	Understand the risks involved in ownership of a business.
14.04	Understand the business skills needed to operate a small business efficiently and effectively.
14.05	Understand basic management principles (i.e., principles of management, business management, industrial management and organizational behavior).

	14.06 Understand basic economics (macro or micro).
	14.07 Demonstrate an understanding of basic industrial relations (i.e., personnel management, labor relations, supervision and productivity).
	14.08 Demonstrate an understanding of basic principles of business law.
15.0	Schedule and coordinate work sequence. The student will be able to:
	15.01 Identify the work activities associated with a construction schedule.
	15.02 Understand how to estimate the duration for each activity or task of work.
	15.03 Identify the logical sequence required to perform the work.
	15.04 Incorporate estimated activity cost into the proposed Critical Path Method (CPM) schedule.
	15.05 Assign and analyze resource requirements of a project.
	15.06 Prepare oral presentations of construction schedules.
	15.07 Prepare various construction scheduling reports.
	15.08 Utilize computer information technology for project planning, design, scheduling, monitoring and controlling.
	15.09 Maintain a project schedule during construction and adjust for actual events. Understand how to overcome project delays.
	15.10 Understand how to manually perform a forward/backward pass on a project schedule to determine early start and finish dates, float, and critical path for a project schedule.
16.0	Learn to effectively manage a workforce. The student will be able to:
	16.01 Determine work activity manpower requirements.
	16.02 Recognize the equipment required for a specific workforce.
	16.03 Understand proper and safe methods of construction.
17.0	Learn to effectively “buy out” a project as required. The student will be able to:
	17.01 Interpret drawings and identify the different categories of work specified within the Construction Specifications Institute (CSI) spec format.
	17.02 Identify the specific areas of work and contract the scope of work accordingly.
	17.03 Effectively package the scope of work within a contract format.

	17.04 Identify the cost of each scope of work and compare to budget.
18.0	Demonstrate the ability to use current technology related to the construction process. The student will be able to:
	18.01 Demonstrate a functional (operating) understanding of basic office computer applications.
	18.02 Demonstrate a functional (operating) understanding of construction-specific applications of scheduling, estimating and project control typically used in the construction industry.
	18.03 Demonstrate a basic understanding of Building Information Modeling (BIM) applications as they pertain to design/build and construction management.

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.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Florida Department of Education
Curriculum Framework

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

AS	
CIP Number	1715020101
Program Type	College Credit
Program Length	60 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
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 60 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: **60 Credit Hours**

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:
	• Gradation analysis
	• Limits – liquid and plastic
	• Modified proctor
	• Moisture content-oven and/or speedy
	• Nuclear density (Optional)
	10.02 Make a trial batch and run a standard ASTM International concrete test and compute results for the following:
	• Slump
	• Air entrainment
	• 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 and 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.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Florida Department of Education
Curriculum Framework

Program Title: **Building Trades and Construction Design Technology**
Program Type: **Career Preparatory**
Career Cluster: **Architecture & Construction**

Career Certificate Program		
Program Number	C100100	
CIP Number	0646041506	
Grade Level	30, 31	
Program Length	900 Hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

The purpose of this program is to prepare students for employment or advanced training in the building construction industry.

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 applying construction techniques; reading plans and specifications; and developing trade skills in carpentry, masonry, electricity, plumbing and air conditioning.

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 four occupational completion points.

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

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	BCV 0080	Building Construction Assistant	AC HEAT ME @7 7G BLDG CONST @7 7G BLDG MAINT @7 7G CARPENTRY @7 7G DRAFTING @7 7G ELECTRICAL @7 7G ENG 7G PLUMBIN @7 7G ROOFING 7G SHEETMETAL @7 7G TEC CONSTR @7 7G TEC DRAFT 7G TEC ED 1@2 ENG&TEC ED1@2 TROWEL TR 7G	450 Hours
B	BCV 0081	Carpentry and Masonry Technician		150 Hours
C	BCV 0082	Electrical and Plumbing Technician		150 Hours
D	BCV 0083	Building Maintenance Technician		150 Hours

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Demonstrate safety practices and follow disaster plans.
02.0 Identify and use basic hand tools.
03.0 Identify power tools and describe their proper operation.
04.0 Discuss, identify, classify and present construction components, materials, hardware and characteristics.
05.0 Demonstrate an understanding of the construction industry and related occupations.
06.0 Explain the importance of employability and entrepreneurship skills.
07.0 Demonstrate or discuss rough and finish carpentry skills.
08.0 Demonstrate or discuss masonry skills.
09.0 Demonstrate or discuss painting and decorating skills.
10.0 Demonstrate or discuss science knowledge and skills.
11.0 Demonstrate mathematics knowledge and skills.
12.0 Explain all that the built environment encompasses.
13.0 Demonstrate an understanding of the natural environment, built environment and green built environment.
14.0 Research laws applicable to the construction industry.
15.0 Develop a basic understanding of construction contracts, drawings, documents and specifications and how they apply to the construction process.
16.0 Demonstrate or discuss electrical rough in skills.
17.0 Demonstrate or discuss finish electrical skills.
18.0 Demonstrate or discuss plumbing rough in skills.
19.0 Demonstrate or discuss finish plumbing skills.
20.0 Demonstrate Heating, Ventilation and Air Conditioning (HVAC) rough in skills.
21.0 Demonstrate finish HVAC skills.
22.0 Design a capstone project using skills learned throughout the program.

Florida Department of Education
Student Performance Standards

Program Title: Building Trades and Construction Design Technology
Career Certificate Program Number: C100100

Course Number: BCV 0080 **Occupational Completion Point: A** **Building Construction Assistant – 450 Hours**	
01.0	Demonstrate safety practices and follow disaster plans. The student will be able to:
01.01	Observe and comply with all applicable company and organizational safety policies and Occupational Safety and Health Administration (OSHA) rules and regulations.
01.02	Be able to demonstrate the purpose of Safety Data Sheets (SDS), formerly known as Material Safety Data Sheets (MSDS), and follow the procedures as necessary.
01.03	Identify health-related problems that may result from exposure to work-related chemicals and hazardous materials, and demonstrate knowledge of the proper precautions required for handling such materials. (Refer to Safety Data Sheets.)
01.04	Discuss, analyze and discuss the “Right-to-Know” law, such as with chemical or health hazards, as recorded in (29 CFR-1910.1200).
01.05	Identify and demonstrate the use of safety equipment such as fall arrest systems, fire extinguishers, scaffolds and ladders.
01.06	Identify and interpret follow disaster plans.
01.07	Describe and demonstrate appropriate safety attitudes and behaviors in the shop and on the job in construction industry.
01.08	Describe and demonstrate the appropriate safe use and maintenance of portable and stationary power equipment in the shop and on the job in the construction industry.
01.09	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.10	Explain and demonstrate emergency procedures to follow in response to workplace accidents.
01.11	Create a disaster and/or emergency response plan for a specific instance (earthquake, hurricane, tornado, etc.).
02.0	Identify and use basic hand tools. The student will be able to:
02.01	Select and utilize appropriate hand tools typically used in the construction industry for specific tasks in accordance with safety guidelines and standard practice.
03.0	Identify power tools and describe their proper operation. The student will be able to:
03.01	Select and utilize appropriate power tools and equipment for specific tasks in accordance with safety guidelines.
04.0	Discuss, identify, classify and present construction components, materials, hardware and characteristics. The student will be able to:

	04.01 Discuss, identify and present the various components, materials and hardware used in residential construction applications.
	04.02 Discuss, identify and present the various components, materials and hardware used in commercial construction applications.
	04.03 Discuss, identify and present the various components, materials and hardware used in industrial construction applications.
	04.04 Discuss and present preplanning and procedural steps to accomplish various projects large and small both in the lab and on the job site with attention to building codes, standard practice and acceptable techniques.
05.0	Demonstrate an understanding of the construction industry and related occupations. The student will be able to:
	05.01 Identify and distinguish construction trade occupations and the roles and responsibilities of each craft.
	05.02 Identify and distinguish construction project management occupations and the roles and responsibilities of each.
	05.03 Identify and differentiate design and engineering occupations and the roles and responsibilities of each.
	05.04 Assess and discuss the relationship between the Department of Labor and the construction industry, economy and opportunity for employment.
06.0	Explain the importance of employability and entrepreneurship skills. The students will be able to:
	06.01 Identify and demonstrate positive work behaviors needed to be employable.
	06.02 Develop personal career plan that includes goals, objectives and strategies.
	06.03 Examine and explain licensing, certification and industry credentialing requirements.
	06.04 Maintain a career portfolio to document knowledge, skills and experience.
	06.05 Evaluate and compare employment opportunities that match career goals.
	06.06 Identify and exhibit traits for retaining employment.
	06.07 Identify opportunities and research requirements for career advancement.
	06.08 Explain and practice the benefits and necessity of ongoing professional development.
	06.09 Examine and describe entrepreneurship and leadership opportunities as a career planning option.
	06.10 Conduct a job search and analyze the requirements of the job.
	06.11 Understand the consequences of poor decision making.
	06.12 Assess the importance of confidentiality in the workplace.

	06.13 Determine healthy living habits in relation to work.
07.0	Demonstrate or discuss rough and finish carpentry skills. The student will be able to:
	07.01 Discuss the carpentry trade and explain the duties of a carpenter.
	07.02 Identify and use building materials, fasteners and adhesives.
	07.03 Use and maintain hand and power tools.
	07.04 Read and interpret approved plans and specifications for residential and commercial drawings.
	07.05 Apply linear and distance measurements, leveling, plumbing and squaring techniques.
	07.06 Analyze a survey and develop site layout.
	07.07 Construct and remove concrete forms, handle and place concrete, reinforcing materials and finish concrete.
	07.08 Understand the potential hazards involved in handling concrete and proper protective measures and PPE.
	07.09 Calculate, layout construct and install floor, wall, ceiling and roof framing.
	07.10 Calculate, layout and construct and install basic stair layout.
	07.11 Understand building science of thermal and moisture protection and mitigating measures.
	07.12 Calculate and install roofing applications.
	07.13 Install windows and interior /exterior doors and door hardware.
	07.14 Calculate, construct and install exterior finishing.
	07.15 Install drywall and apply finishing techniques.
	07.16 Install cabinets and built-in fabrications.
	07.17 Calculate and install window, door, floor and ceiling trim.
	07.18 Calculate, layout and construct metal stud framing.
	07.19 Calculate, layout and install suspended ceilings.
08.0	Demonstrate or discuss masonry skills. The student will be able to:
	08.01 Describe and discuss orientations to the masonry trade.

	08.02 Identify and select basic masonry tools and equipment.
	08.03 Use, maintain and store masonry hand tools, power tools and equipment safely and in proper working order.
	08.04 Read and interpret measurements, drawings and specifications for masonry building projects.
	08.05 Demonstrate safe and proper procedures for set up / tear down and maintaining masonry work sites and projects.
	08.06 Utilize the tools and equipment used for mixing mortar.
	08.07 Analyze the factors that affect the consistency of mortar.
	08.08 Determine masonry ratios, their strengths and applications of mortar mixtures M, S, N, O and K.
	08.09 Mix various types of mortar, considering application and or discuss (PSI) strength.
	08.10 Lay out square corners using the 3-4-5 (or Pythagorean Theorem) and building instrument methods for masonry projects.
	08.11 Lay out and install dry bonds for masonry block corner leads projects.
	08.12 Lay out and build corner leads for masonry block projects.
	08.13 Identify and describe various masonry units and installation techniques.
	08.14 Implement the methods of putting up the line.
	08.15 Utilize pointing tools to strike mortar joints.
	08.16 Identify and use the various types of trowels.
	08.17 Mix and apply stucco to a project.
09.0	Demonstrate or discuss painting and decorating skills. The student will be able to:
	09.01 Identify, describe and use various painting tools and equipment.
	09.02 Properly erect an extension ladder, step ladder and a scaffold.
	09.03 Prepare surfaces for application of finishes.
	09.04 Identify and describe various painting and application techniques.
	09.05 Apply finishes to a project including primers, paints, stains varnishes, wall coverings and textures.
	09.06 Use appropriate techniques and materials for clean-up and tool and material storage.

10.0	Demonstrate or discuss science knowledge and skills. The students will be able to:
10.01	Explore new technology as it applies to the construction industry in terms of materials, processes and the need for continuing education.
10.02	Investigate the use of communication technology and other resources to inspire design decisions.
11.0	Demonstrate mathematics knowledge and skill. -The students will be able to:
11.01	Solve job-related problems by adding, subtracting, multiplying and dividing numbers using fractions, decimals and whole numbers.
11.02	Change fractions and decimals to percent.
11.03	Solve job-related problems using a calculator, tape measure, or on paper, for basic computations.
11.04	Read a ruler and a tape measure accurately.
11.05	Compute yards, feet, inches and fractions of inches.
11.06	Change hours and minutes to decimals, fractions and mixed numbers.
11.07	Construct charts/tables/graphs using functions and data.
11.08	Determine ratios and proportions.
11.09	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares and cylinders.
11.10	Measure tolerance(s) on horizontal and vertical surfaces using metric (centimeters and millimeters) and english (feet, inches and fractions) units.
11.11	Analyze and apply data and measurements to solve problems and interpret documents.
11.12	Calculate man hours and labor costs for a specific job.
12.0	Explain all that the built environment encompasses. The student will be able to:
12.01	Discuss the development of construction technology, its impact on the built environment and the impact of growth on the construction industry.
12.02	Describe and give examples of the influences and benefits of the construction industry on health and safety, communication, transportation and the economy.
12.03	Examine and compare the relationship between the built environment and the natural environment.
12.04	Compare the relationship between architectural designs and/or models to understand aesthetic details.
12.05	Analyze changes in architectural styles and construction practices over time relative to various environments.

12.06	Discuss how technology has changed the design process throughout history.
13.0	Demonstrate an understanding of the natural environment, built environment and green built environment. The student will be able to:
13.01	Recognize and analyze the development of the built environment and its impacts on the natural environment such as pollution, deforestation, climate change, health and disease.
13.02	Describe and give examples of how a green built environment creates growth for the construction industry, and the economy such as health and safety, transportation and natural resources.
13.03	Examine and compare the relationship between a green built environment and the natural environment.
13.04	Explain the purpose of the United States Green Building Council (USGBC), the Green Building Certification Institute (GBCI) and Leadership for Energy and Environmental Design (LEED) are and how they create growth for the construction industry and the economy.
13.05	Discuss sustainable building design and its relationship between health, energy efficiency and money savings for government, businesses and individuals.
13.06	Discuss the effects of building science on construction and energy efficiency.
13.07	Discuss renewable fuels and energy.

Course Number: BCV 0081 **Occupational Completion Point: B** **Carpentry and Masonry Technician – 150 Hours**	
14.0	Research laws applicable to the construction industry. The student will be able to:
14.01	Discuss and analyze the governmental law process at the federal, state and local level and its impact on the construction industry and construction education.
14.02	Identify and analyze the Codes of Federal Regulations (CFR) pertaining to the construction industry.
14.03	Analyze the Florida State Statues pertaining to the construction industry.
14.04	Compare and contrast trade union and trade non-union workers in terms of their effect and influence on health and safety, communication, transportation and the economy.
14.05	Compare and contrast employment and training with union and non-union entities in the construction industry.
14.06	Examine the role of apprenticeship in the construction industry and its impact on education.
14.07	Research and assess the Florida Department of Business and Professional Regulation.
14.08	Research and assess the Construction Industry Licensing Board, its structure, polices and requirements.
14.09	Research various construction occupations and explain the requirements for becoming licensed.

	14.10 Compare and contrast the roles and responsibilities of the engineers, architects/ designers and the general contractor.
	14.11 Compare and contrast the roles and responsibilities of the general contractor, subcontractors, specialty contractors and employees of contractors.
	14.12 Identify and differentiate the roles and responsibilities of building construction firms and classifications of construction projects.
	14.13 Understand the process of establishing a business in the construction industry.
	14.14 Assess the relationship between the Department of Labor and new construction projects, new permits and new business start-ups.
	14.15 Understand zoning and assess the need for and impact of zoning requirements on construction projects.
	14.16 Examine and analyze the process of applying for building permits and variances.
15.0	Develop a basic understanding of construction contracts, drawings, documents and specifications and how they apply to the construction process. The student will be able to:
	15.01 Explain the purpose and components of contracts, drawings, documents and specifications and explain their relation to building permits.
	15.02 Analyze the importance of building codes and zoning regulations on the development of drawings and specifications.
	15.03 Identify and interpret the analogy of a full set of drawings including architectural (site plans, foundation plans, floor plans, interior/exterior elevations, sections, details, schedules, etc.), structural, plumbing, mechanical and electrical drawings.
	15.04 Utilize building symbols, drawing lines, abbreviations and scale in the development of blueprints.
	15.05 Prepare lists of materials and specifications.
	15.06 Use architectural and engineering scales.
	15.07 Demonstrate or discuss the basic use of computer-aided design software.
	15.08 Demonstrate or discuss the use of Computer-Aided Drafting (CAD) software to prepare project drawings.
	15.09 Write specifications for a project.
	15.10 Prepare construction documents for a project.

Course Number: BCV 0082 **Occupational Completion Point: C** **Electrical and Plumbing Technician – 150 Hours**	
16.0	Demonstrate or discuss electrical rough in skills. The student will be able to:
	16.01 Identify and apply electrical safety practices and procedures when working with electrical systems. (Refer to NFPA70E standards.)

	16.02 Explain grounding, its purpose and relation to electrical safety.
	16.03 Explain and describe various phases of electrical generation and the transportation and distribution of electricity to sub stations for industrial, business and residential uses (under 480 volts).
	16.04 Design and calculate electrical loads using ohms law to determine power, American wire gauge (AWG) and electrical equipment sizes.
	16.05 Apply basic electrical theory to wiring a project.
	16.06 Wire an air-conditioning system, heat exchanger, heat pump or electric water heater into an electrical supply and properly size wire and overcurrent protection.
	16.07 Design and install a branch circuit system in a project.
	16.08 Discuss and/or install Ground Fault Circuit Interrupter (GFCI) circuitry.
	16.09 Troubleshoot electrical systems, using testing and metering devices.
	16.10 Install a meter, distribution panel and breaker panel for a project.
	16.11 Identify types of wiring raceways (EMT / IMC / PVC / MC Cable / Romex / SE Cable / UF Cable).
	16.12 Install conduit, pipe, shielded electrical cable and electrical boxes in a project.
17.0	Demonstrate or discuss finish electrical skills. The student will be able to:
	17.01 Install electrical components relating to residential & commercial applications.
	17.02 Troubleshoot and inspect electrical systems.
18.0	Demonstrate or discuss plumbing rough in skills. The student will be able to:
	18.01 Identify, select and install various pipes, tubing, fittings and connectors used in the plumbing trade for a specific project.
	18.02 Lay out and install a water distribution (supply) system for a project.
	18.03 Lay out and install a Drain, Waste and Vent (DWV) system for a project.
	18.04 Test and inspect plumbing systems.
	18.05 Discuss the design and layout of a domestic solar hot water system.
19.0	Demonstrate or discuss finish plumbing skills. The student will be able to:
	19.01 Install bathroom fixtures and hardware such as lavatories, water closets, urinals, showers, bathtubs and traps.

	19.02 Install kitchen fixtures and hardware such as sinks, garbage disposals, faucets, dishwasher, icemaker and hot water heater tanks.
20.0	Demonstrate Heating, Ventilation and Air Conditioning (HVAC) rough in skills. The student will be able to:
	20.01 Explain heating and cooling principles and code requirements.
	20.02 Perform basic calculations for heating and cooling loads.
	20.03 Develop an understanding of building envelope, insulation and ventilation.
	20.04 Select and discuss or install the components of an air conditioning system for a project including ductwork, coolant lines, compressor packages and coil packages.
	20.05 Identify and select refrigerants according to their properties.
21.0	Demonstrate finish HVAC skills. The student will be able to:
	21.01 Determine a refrigerant level.
	21.02 Install a control system for a project.
	21.03 Install registers for a project.
	21.04 Examine computer-monitoring systems associated with HVAC control systems and air-quality management.

Course Number: BCV 0083 **Occupational Completion Point: D** **Building Maintenance Technician – 150 Hours**	
22.0	Design a capstone project using skills learned throughout the program. The student will be able to:
	22.01 Solve design and construction problems to gain new perspectives.
	22.02 Apply critical-thinking and problem solving skills used in design to develop solutions for real-life issues.
	22.03 Use and maintain tools and equipment used in the construction process.
	22.04 Work in a project team to develop cohesiveness, team building, respectful compromise and time-management skills
	22.05 Apply carpentry skills.
	22.06 Apply masonry skills.
	22.07 Apply Mechanical, Electrical and Plumbing (MEP) skills.

22.08 Apply construction industry safety.
22.09 Apply sustainable construction practices.
22.10 Apply learned and acquired skills to address construction industry standards, methods and techniques.

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 co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Drafting**
Program Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

Career Certificate Program		
Program Number	C100200	
CIP Number	0615130100	
Grade Level	30,31	
Program Length	1500 Hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 10	Communications (Reading and Language Arts): 9

Purpose

The purpose of this program is to prepare students for employment in the drafting industry.

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 freehand sketching, drafting by hand and computer and 3D modeling.

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 seven occupational completion points. When the recommended sequence is followed, the structure will allow students to complete specified portions of the program for employment or to remain for advanced training. A student who completes the applicable competencies at any occupational completion point may either continue with the training program or become an occupational completer.

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

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	TDR0070	Introduction to Drafting	BLDG CONSTR @7 7G DRAFTING @7 7G TEC DRAFT 7G TEC CONSTR @7 7G	150 Hours
B	TDR0370	Drafting Assistant		450 Hours
C	TDR0775 TDR0776	Drafting Detailer 1 Drafting Detailer 2		150 Hours 150 Hours
D	TDR0570	Architectural Drafter		150 Hours
E	TDR0874	Civil Drafter		150 Hours
F	TDR0777	Mechanical Drafter		150 Hours
G	TDR0875	Structural Drafter		150 Hours

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Apply basic drafting skills.
02.0 Demonstrate algebra mathematics knowledge and skills related to drafting.
03.0 Prepare multi-view drawings.
04.0 Prepare sectional views.
05.0 Prepare auxiliary drawings.
06.0 Apply basic dimensioning.
07.0 Prepare pictorial drawings.
08.0 Prepare surface developments.
09.0 Perform basic Computer-Aided Drafting (CAD) functions.
10.0 Prepare physical three-dimensional (3-D) model from a two-dimensional (2-D) drawing.
11.0 Prepare basic architectural drawings.
12.0 Demonstrate geometry and mathematics knowledge and skills related to drafting.
13.0 Demonstrate mathematics knowledge and skills with respect to market and industry applications of drafting.
14.0 Apply tolerance dimensioning.
15.0 Demonstrate an understanding of basic civil drawings.
16.0 Demonstrate basic electrical/electronic literacy.
17.0 Perform advanced CAD functions.
18.0 Prepare a basic digital 3-D model from a 2-D drawing.
19.0 Explain the importance of employability and entrepreneurship skills.
20.0 Prepare computer-aided 3-D architectural drawings.
21.0 Prepare architectural multi-level residential drawings.
22.0 Prepare a basic site/plot plan drawing.
23.0 Prepare a basic landscape plan drawing.
24.0 Convert a basic architectural 3-D model to a mechanically created prototype.
25.0 Prepare advanced computer-aided mechanical working drawings.
26.0 Convert a computer-aided 3-D model to a rapid prototype of a mechanical device.
27.0 Prepare a typical wall section.
28.0 Prepare a basic foundation plan drawing.
29.0 Prepare a basic electrical plan drawing.
30.0 Prepare a basic Heating, Ventilation and Air-Conditioning (HVAC) plan drawing.
31.0 Prepare a basic plumbing plan drawing.
32.0 Prepare a digital scale 3-D model from a 2-D drawing.
33.0 Prepare architectural drawings for a commercial building.
34.0 Prepare basic building utility drawings for a commercial building.
35.0 Prepare presentation drawings for a commercial building.
36.0 Integrate drawing sets.

37.0 Convert computer-aided 3-D or building information models to rapid prototypes of a building design or building components.
38.0 Engage in project planning activities to expedite the completion of architectural projects.
39.0 Prepare computer-aided map details.
40.0 Understand surveying and mapping procedures.
41.0 Prepare advanced map drawings.
42.0 Prepare advanced civil drawings.
43.0 Engage in project planning activities to expedite the completion of civil drafting projects.
44.0 Prepare advanced mechanical drawings.
45.0 Prepare production drawings using 3-D CAD techniques.
46.0 Prepare pneumatic/hydraulic drawings.
47.0 Prepare tool drawings using 3-D CAD techniques.
48.0 Engage in project planning activities to expedite the completion of mechanical drafting projects.
49.0 Prepare structural details.
50.0 Prepare structural steel drawings.
51.0 Prepare reinforced concrete drawings.
52.0 Prepare structural wood drawings.
53.0 Prepare advanced 3-D computer-aided drawings.

Florida Department of Education
Student Performance Standards

Program Title: Drafting
Career Certificate Program Number: C100200

Course Number: TDR0070 **Occupational Completion Point: A** **Introduction to Drafting – 150 Hours**	
01.0	Apply basic drafting skills. The student will be able to:
01.01	Use drafting equipment, measuring scales and drafting instruments.
01.02	Identify the various drafting media and techniques.
01.03	Use various freehand and other architectural lettering techniques including cursive and block.
01.04	Prepare title blocks and other drafting formats.
01.05	Demonstrate the use of the Alphabet of Lines.
01.06	Prepare axonometric, oblique and multi-view freehand sketches.
01.07	Prepare charts, graphs and diagrams.
01.08	Apply geometric construction techniques.
02.0	Demonstrate algebra mathematics knowledge and skills related to drafting. The student will be able to:
02.01	Demonstrate knowledge of arithmetic operations.
02.02	Solve arithmetic problems.
02.03	Solve algebra problems.
02.04	Solve geometry problems.
02.05	Apply multiple discipline calculations.
02.06	Construct charts, tables and graphs using functions and data.
03.0	Prepare multi-view drawings. The student will be able to:
03.01	Prepare multi-view scaled drawings.

	03.02 Select proper drawing scale, views and layout.
	03.03 Prepare drawings containing horizontal and vertical surfaces.
	03.04 Prepare drawings containing circles and/or arcs.
	03.05 Prepare drawings incorporating removed details and conventional breaks.
04.0	Prepare sectional views. The student will be able to:
	04.01 Prepare drawings containing full sections and half sections.
	04.02 Prepare drawings containing offset sections.
	04.03 Prepare drawings containing revolved sections.
	04.04 Prepare drawings containing removed sections and broken-out sections.
	04.05 Prepare a sectional assembly drawing applying material symbols.
05.0	Prepare auxiliary drawings. The student will be able to:
	05.01 Prepare drawings containing primary auxiliary views.
	05.02 Prepare drawings containing auxiliary views that include curved lines.
06.0	Apply basic dimensioning. The student will be able to:
	06.01 Prepare drawings containing linear, angular and circular standard dimensions.
	06.02 Prepare drawings using metric dimensions.
	06.03 Prepare drawings using general and local notes.
	06.04 Apply basic tolerance techniques and tolerance dimensioning.
	06.05 Understand the differences between dimensioning architectural, civil and mechanical drawings.
07.0	Prepare pictorial drawings. The student will be able to:
	07.01 Prepare isometric and oblique pictorial drawings.
	07.02 Prepare one-point and two-point perspectives.
08.0	Prepare surface developments. The student will be able to:

	08.01 Prepare developments of a prism, a cylinder, a cone and a pyramid.
	08.02 Prepare developments of a transition piece.
	08.03 Prepare drawing involving intersecting pieces.
09.0	Perform basic Computer-Aided Drafting (CAD) functions. The student will be able to:
	09.01 Perform drawing set up.
	09.02 Construct geometric figures of lines, splines, circles and arcs.
	09.03 Create and edit text using appropriate style and size to annotate drawings.
	09.04 Use and control accuracy enhancement tools for entity positioning methods such as snap and XYZ.
	09.05 Utilize editing commands.
	09.06 Control entity properties by level or layer, color and line style or type.
	09.07 Use viewing commands to perform zooming and panning.
	09.08 Plot or print drawings on media using layout and scale.
	09.09 Apply standard dimensioning rules.
10.0	Prepare physical three-dimensional (3-D) model from a two-dimensional (2-D) drawing. The student will be able to:
	10.01 Create a primitive physical 3-D model from a 2-D design containing linear and angular dimensions.
	10.02 Create a physical primitive 3-D model from a 2-D design containing circular dimensions.

Course Number: TDR0370 Occupational Completion Point: B Drafting Assistant – 450 Hours	
11.0	Prepare basic architectural drawings. The student will be able to:
	11.01 Understand architectural terminology.
	11.02 Read and interpret architectural drawings.
	11.03 Prepare a plot/site plan.

	11.04 Prepare a floor plan.
	11.05 Prepare a roof plan.
	11.06 Prepare exterior elevations.
	11.07 Prepare a typical wall section.
12.0	Demonstrate geometry and mathematics knowledge and skills related to drafting. The student will be able to:
	12.01 Solve right-angle trigonometric problems.
	12.02 Analyze and apply data and measurements to solve problems and interpret documents.
13.0	Demonstrate mathematics knowledge and skills with respect to market and industry applications of drafting. The student will be able to:
	13.01 Demonstrate an understanding of federal, state and local taxes and their computation.
	13.02 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares and cylinders.
	13.03 Measure tolerances on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
	13.04 Determine the correct purchase price, to include sales tax, for a materials list containing a minimum of six items.
14.0	Apply tolerance dimensioning. The student will be able to:
	14.01 Apply tolerance dimensioning in inches and feet.
	14.02 Dimension tolerance using millimeters and centimeters.
15.0	Demonstrate an understanding of basic civil drawings. The student will be able to:
	15.01 Understand civil drawing terminology.
	15.02 Read and interpret civil drawings.
	15.03 Prepare a civil plan with topography and profile drawing.
16.0	Demonstrate basic electrical/electronic literacy. The student will be able to:
	16.01 Identify electrical/electronic symbols.
	16.02 Prepare schematic/block diagrams and/or electric plans.
17.0	Perform advanced CAD functions. The student will be able to:

	17.01 Identify, create, store and use standard part symbols and libraries.
	17.02 Understand how to minimize file size.
	17.03 Use query commands to interrogate database for entity characteristics, distance, area and status.
18.0	Prepare a basic digital 3-D model from a 2-D drawing. The student will be able to:
	18.01 Create a basic digital 3-D model from a 2-D design containing linear and angular dimensions.
	18.02 Create a basic digital 3-D model from a 2-D design containing circular dimensions.
19.0	Explain the importance of employability and entrepreneurship skills. The student will be able to:
	19.01 Identify and demonstrate positive work behaviors needed to be employable.
	19.02 Develop a personal career plan that includes goals, objectives and strategies.
	19.03 Prepare a resume.
	19.04 Examine licensing, certification and industry credentialing requirements.
	19.05 Maintain a career portfolio to document knowledge, skills and experience.
	19.06 Evaluate and compare employment opportunities that match career goals.
	19.07 Identify and exhibit traits for retaining employment.
	19.08 Identify opportunities and research requirements for career advancement.
	19.09 Research the benefits of ongoing professional development.
	19.10 Examine and describe entrepreneurship opportunities as a career planning option.
	19.11 Demonstrate knowledge of the "Right-To-Understand" law as recorded in (29 CFR-1910.1200).

Course Number: TDR0775 **Occupational Completion Point: C** **Drafting Detailer 1 – 150 Hours**	
20.0	Prepare computer-aided 3-D architectural drawings. The student will be able to:
	20.01 Draw a floor plan.

	20.02 Prepare isometric exterior views.
	20.03 Prepare perspective exterior views.
21.0	Prepare architectural multi-level residential drawings. The student will be able to:
	21.01 Prepare a first floor plan.
	21.02 Prepare a second floor plan.
	21.03 Prepare a basic roof framing layout drawing.
	21.04 Prepare a two-story elevation drawing.
	21.05 Prepare a second floor framing plan.
	21.06 Create a stair drawings and details.
22.0	Prepare a basic site/plot plan drawing. The student will be able to:
	22.01 Layout a residential site/plot plan.
	22.02 Indicate site/plot size, orientation and limits.
	22.03 Layout a public street, sidewalk and public utility lines.
	22.04 Write a site/plot legal description.
	22.05 Dimension a building location.
	22.06 Layout and label specialty features (patio, deck, pool, gazebo, etc.).
	22.07 Locate easements and setbacks.
23.0	Prepare a basic landscape plan drawing. The student will be able to:
	23.01 Layout landscape features.
	23.02 Develop a schedule of plants and shrubs.
	23.03 Develop a list of landscape symbols.
24.0	Convert a basic architectural 3-D model to a mechanically created prototype. The student will be able to:
	24.01 Use a digital 3-D model design, containing linear and angular features, to 3-D print a basic prototype.

	24.02 Use a digital 3-D model design, containing circular features, to 3-D print a basic prototype.

Course Number: TDR0776 Occupational Completion Point: C Drafting Detailer 2 – 150 Hours	
25.0	Prepare advanced computer-aided mechanical working drawings. The student will be able to:
	25.01 Prepare dimensioned multi-view drawings applying CAD techniques.
26.0	Convert a computer-aided 3-D model to a rapid prototype of a mechanical device. The student will be able to:
	26.01 Prepare computer-aided 3-D mechanical model.
	26.02 Use a digital 3-D model, containing linear and angular features, to 3-D print a prototype of a mechanical device.
	26.03 Use a digital 3-D model, containing circular dimensions, to 3-D print a prototype of a mechanical device.
27.0	Prepare a typical wall section. The student will be able to:
	27.01 Prepare a two-story residential wall section.
	27.02 Apply notes and dimensions to a residential wall section.
28.0	Prepare a basic foundation plan drawing. The student will be able to:
	28.01 Prepare a foundation plan drawing for a residence.
	28.02 Prepare foundation detail drawings.
29.0	Prepare a basic electrical plan drawing. The student will be able to:
	29.01 Prepare an electrical plan for a residence.
	29.02 Prepare an electrical symbols legend for an electrical plan.
30.0	Prepare a basic Heating, Ventilation and Air-Conditioning (HVAC) plan drawing. The student will be able to:
	30.01 Prepare an HVAC plan for a residence.
	30.02 Prepare an HVAC symbols legend for an HVAC plan.
31.0	Prepare a basic plumbing plan drawing. The student will be able to:

	31.01 Prepare a plumbing plan for a residence.
	31.02 Prepare a plumbing symbols legend for a plumbing plan.
32.0	Prepare a digital scale 3-D model from a 2-D drawing. The student will be able to:
	32.01 Create a digital scale 3-D model from a 2-D design containing linear and angular features.
	32.02 Create a digital scale 3-D model from a 2-D design containing circular features.

Course Number: TDR0570 Occupational Completion Point: D Architectural Drafter – 150 Hours	
33.0	Prepare architectural drawings for a commercial building. The student will be able to:
	33.01 Interpret commercial catalogs, specifications, technical tables, codes and ordinances.
	33.02 Prepare a commercial site plan.
	33.03 Prepare a floor plan with dimensions.
	33.04 Prepare a foundation plan with dimensions and a footing schedule.
	33.05 Prepare a roof plan to include a drainage plan and a roof framing plan.
	33.06 Prepare elevation drawings.
	33.07 Prepare building section drawings.
	33.08 Prepare door and window schedules.
34.0	Prepare basic building utility drawings for a commercial building. The student will be able to:
	34.01 Prepare an electrical plan.
	34.02 Prepare a riser diagram.
	34.03 Prepare a plumbing plan.
	34.04 Prepare an HVAC plan.
35.0	Prepare presentation drawings for a commercial building. The student will be able to:

	35.01 Produce color pictorial drawings.
	35.02 Prepare dynamic presentation zoom views or a walk-thru.
	35.03 Create a drawing portfolio.
36.0	Integrate drawing sets. The student will be able to:
	36.01 Compile a full drawing set to describe a complete building.
37.0	Convert computer-aided 3-D or building information models to rapid prototypes of a building design or building components. The student will be able to:
	37.01 Use a digital 3-D model containing a parametric component to 3-D print a prototype of a building design.
38.0	Engage in project planning activities to expedite the completion of architectural projects. The student will be able to:
	38.01 Understand what it takes to schedule and plan for architectural project tasks.
	38.02 Understand how to network with stakeholders to manage budgets, resources and deadlines.
	38.03 Produce project deliverables per negotiated obligations.

Course Number: TDR0874 **Occupational Completion Point: E** **Civil Drafter – 150 Hours**	
39.0	Prepare computer-aided map details. The student will be able to:
	39.01 Prepare a map using bearings.
	39.02 Prepare a map using coordinates.
	39.03 Convert a map into metric dimensions.
40.0	Understand surveying and mapping procedures. The student will be able to:
	40.01 Analyze basic mapping specifications.
	40.02 Interpret aerial photogrammetry.
	40.03 Identify horizontal measures.
	40.04 Identify leveling procedures.

	40.05 Interpret angular measurements.
	40.06 Interpret legal descriptions.
41.0	Prepare advanced map drawings. The student will be able to:
	41.01 Prepare a traverse drawing.
	41.02 Prepare a street layout drawing.
	41.03 Prepare an advanced map drawing.
	41.04 Prepare a highway drawing.
	41.05 Prepare a topographic drawing.
42.0	Prepare advanced civil drawings. The student will be able to:
	42.01 Prepare a drainage drawing.
	42.02 Prepare a plat drawing.
	42.03 Prepare an advanced plan and profile drawing.
	42.04 Prepare a utility drawing.
43.0	Engage in project planning activities to expedite the completion of civil drafting projects. The student will be able to:
	43.01 Understand what it takes to schedule and plan for civil project tasks.
	43.02 Understand how to network with stakeholders to manage budgets, resources and deadlines.
	43.03 Produce project deliverables per phasing and negotiated obligations.

Course Number: TDR0777 **Occupational Completion Point: F** **Mechanical Drafter – 150 Hours**	
44.0	Prepare advanced mechanical drawings. The student will be able to:
	44.01 Analyze problems using the descriptive geometry method of projection.
	44.02 Identify the various manufacturing methods.

	44.03 Use precision dimensioning to include Geometric Dimensioning and Tolerancing (GDT) for fits and finishing.
	44.04 Make engineering changes on drawings.
	44.05 Prepare fastener drawings.
	44.06 Prepare a cam drawing with dimensions.
	44.07 Prepare a gear drawing with dimensions.
	44.08 Prepare a spring drawing with dimensions.
45.0	Prepare production drawings using 3-D CAD techniques. The student will be able to:
	45.01 Make a pattern shop detail drawing.
	45.02 Make a casting drawing.
	45.03 Make a forging detail drawing.
	45.04 Make a machining detail drawing.
	45.05 Make a 3D stamping drawing.
	45.06 Make a 3D welding drawing.
	45.07 Prepare an installation drawing.
	45.08 Prepare a Bill of Materials (BOM).
46.0	Prepare pneumatic/hydraulic drawings. The student will be able to:
	46.01 Prepare a piping drawing.
	46.02 Prepare a pictorial piping drawing.
	46.03 Prepare a sectional drawing.
	46.04 Prepare a diagram.
47.0	Prepare tool drawings using 3-D CAD techniques. The student will be able to:
	47.01 Prepare a 3D jig and fixture drawing.
	47.02 Prepare a 3D cutting die drawing.

	47.03 Prepare a 3D forming die drawing.
48.0	Engage in project planning activities to expedite the completion of mechanical drafting projects. The student will be able to:
	48.01 Understand what it takes to schedule and plan mechanical project tasks.
	48.02 Understand how to network with stakeholders to manage budgets, resources and deadlines.
	48.03 Produce project deliverables per phasing and negotiated obligations.

Course Number: TDR0875 Occupational Completion Point: G Structural Drafter – 150 Hours	
49.0	Prepare structural details. The student will be able to:
	49.01 Interpret structural manuals and technical tables.
	49.02 Draw structural connections.
50.0	Prepare structural steel drawings. The student will be able to:
	50.01 Interpret codes and specifications.
	50.02 Use the Timber Construction Manual and other technical data.
	50.03 Understand reactions and stresses.
	50.04 Interpret shear and moment diagrams.
	50.05 Detail bolted connections.
	50.06 Detail welded connections.
	50.07 Prepare erection plans and schedules.
	50.08 Prepare an advance bill for ordering materials.
51.0	Prepare reinforced concrete drawings. The student will be able to:
	51.01 Interpret codes and specifications.
	51.02 Interpret engineering drawings.

	51.03 Prepare beam and column drawings and schedules.
	51.04 Prepare footing and foundation drawings.
	51.05 Prepare floor and roof detail drawings.
	51.06 Prepare special structure detail drawings.
	51.07 Prepare a bar list and schedule.
52.0	Prepare structural wood drawings. The student will be able to:
	52.01 Interpret codes and specifications.
	52.02 Prepare fastening and connection details.
	52.03 Prepare framing plans.
53.0	Prepare advanced 3-D computer-aided drawings. The student will be able to:
	53.01 Produce structural (steel, wood and reinforced concrete) 3-D drawings.

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 co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Computer-Aided Drawing and Modeling**
Program Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

Career Certificate Program		
Program Number	C100300	
CIP Number	0615130205	
Grade Level	30,31	
Program Length	1200 Hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 10	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the 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 the use of software to convert the engineering or architectural designs into technical drawings. Students can specialize in architectural, civil, or mechanical drafting and use technical drawings to help design everything from microchips to skyscrapers.

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

Program Structure

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

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in

accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44(3)(b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	TDR0301	CAD & Modeling I	BLDG CONSTR @7 7G DRAFTING @7 7G TECH DRAFT 7G TECH CONSTR @7 7G	450 hours
B	TDR0302	CAD & Modeling II		450 hours
C	TDR0303 **OR** TDR0306 **OR** TDR0305	Building Information Modeling CAD Technician* **OR** Civil/Geographic Information Systems CAD Technician* **OR** Mechanical CAD Technician*		300 hours

* **NOTE: Students may choose one of the following courses for the completion of OCP C: TDR0303, TDR0305 or TDR0306**

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

CAD & Modeling I

01.0 Apply basic computer-aided drawing (CAD) skills.
02.0 Demonstrate mathematics knowledge and skills.
03.0 Prepare multi-view drawings.
04.0 Prepare auxiliary drawings.
05.0 Apply basic dimensioning.
06.0 Prepare pictorial drawings.
07.0 Prepare surface developments.
08.0 Prepare basic computer-aided architectural drawings.
09.0 Demonstrate basic electrical/electronic literacy.
10.0 Perform basic computer-aided drawing functions.
11.0 Explain the importance of employability and entrepreneurship skills.
12.0 Prepare basic computer-aided two-dimensional architectural drawings.
13.0 Prepare basic computer-aided two-dimensional architectural multi-level drawings for a residential project.
14.0 Prepare a basic two-dimensional plot plan drawing for a residential project.
15.0 Prepare a basic two-dimensional landscape plan drawing for a residential project.
16.0 Prepare computer-aided mechanical working drawings.
17.0 Prepare computer-aided three-dimensional mechanical drawings.
18.0 Prepare a typical two-dimensional wall section for a residence.
19.0 Prepare a basic foundation plan drawing for a residential project.
20.0 Prepare a basic electrical plan drawing for a residential structure.
21.0 Prepare a basic heating, ventilation and air-conditioning (HVAC) plan drawing for a residential structure.
22.0 Prepare a basic two dimensional and isometric plumbing plan drawing for a residential structure.
23.0 Demonstrate mathematics knowledge and skills.

CAD & Modeling II

24.0 Prepare computer-aided 3D architectural drawings using building information modeling (BIM) tools.
25.0 Prepare advanced computer-aided 3D architectural multi-level drawings for a residential BIM project.
26.0 Prepare an advanced three-dimensional site plan drawing.
27.0 Prepare an advanced landscape plan drawing.
28.0 Prepare an advanced wall section using building information modeling.
29.0 Prepare an advanced drawing of a foundation plan for a residential BIM project.
30.0 Prepare an advanced drawing of an electrical plan for a residential BIM project.
31.0 Prepare an advanced drawing of a heating, ventilation & air-conditioning (HVAC) plan for a residential BIM project.
32.0 Prepare an advanced drawing of a plumbing plan for a residential BIM project.

Building Information Modeling CAD Technician

33.0 Prepare computer-aided 3D architectural commercial drawings using building information modeling tools.
34.0 Prepare an advanced drawing of the foundation and footing plan for a commercial BIM project.
35.0 Prepare advanced electrical plans for a commercial BIM project.
36.0 Prepare three-dimensional presentation drawings for a commercial BIM project.
37.0 Prepare structural details for a commercial BIM project.
38.0 Prepare structural steel drawings for a commercial BIM project.
39.0 Prepare reinforced concrete drawings for a commercial BIM project.
40.0 Prepare structural wood drawings for a commercial BIM project.
41.0 Prepare advanced three-dimensional computer-aided drawings for a commercial building.
42.0 Prepare advanced heating, ventilation and air-conditioning (HVAC) plans for a commercial BIM project.
43.0 Prepare advanced plumbing plan drawings for a commercial BIM project.

Civil/Geographic Information Systems CAD Technician

44.0 Demonstrate understanding of basic civil drawings.
45.0 Prepare computer-aided map details.
46.0 Understand surveying and mapping procedures.
47.0 Prepare advanced map drawings.
48.0 Prepare advanced civil drawings.
49.0 Demonstrate an understanding of geographic coordinate systems.
50.0 Perform map creation activities.
51.0 Perform Geographic Information System (GIS) data file creation activities.
52.0 Perform GIS data file manipulation activities.
53.0 Perform GIS spatial analysis activities.
54.0 Perform database operations.
55.0 Engage in project planning activities to expedite the completion of civil mapping projects.

Mechanical CAD Technician

56.0 Prepare advanced mechanical drawings.
57.0 Prepare production drawings using 3D CAD techniques.
58.0 Prepare tool drawings using 3D CAD techniques.
59.0 Engage in project planning activities to expedite the completion of mechanical drafting projects.
60.0 Prepare advanced modeling analysis using Finite Element Method (FEM) techniques.

Florida Department of Education
Student Performance Standards

Program Title: **Computer-Aided Drawing and Modeling**
Career Certificate Program Number: **C100300**

Course Number: TDR0301 **Occupational Completion Point: A** **CAD & Modeling I – 450 Hours**	
01.0	Apply basic Computer-Aided Drawing (CAD) skills. The student will be able to:
01.01	Identify the responsibilities of beginning and experienced CAD technicians.
01.02	Use engineering design equipment, measuring scales and drawing instruments.
01.03	Distinguish between scale types and notations.
01.04	Use various lettering techniques text styles and fonts.
01.05	Identify sheet sizes and title block information.
01.06	Prepare title blocks and other design formats.
01.07	Demonstrate the use of the line weights, associated with various disciplines.
01.08	Prepare axonometric, oblique, isometric and multi-view sketches.
01.09	Prepare multi-view drawings.
01.10	Select proper plot drawing scale, views and layout.
01.11	Apply geometric construction techniques.
01.12	Relate math, writing, drawing, leadership, and communication skills in CAD technician careers.
02.0	Demonstrate mathematics knowledge and skills. The student will be able to:
02.01	Analyze and apply data and measurements to solve problems and interpret documents.
02.02	Analyze drawings using the software features, X-Y coordinates, area, distance, perimeter, etc.
02.03	Perform basic arithmetic functions using fractions and decimals.
02.04	Accurately and efficiently convert between fractions and decimals.

	02.05 Use the decimal/fraction equivalent chart.
	02.06 Use the appropriate mathematical process to solve geometry problems specific to each industry.
	02.07 Apply multiple discipline calculations.
	02.08 Perform basic quantity takeoffs from architectural or engineering drawings or sketches.
	02.09 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
	02.10 Explain the decimal number system.
	02.11 Explain integer numbers, fractional numbers, and real numbers.
	02.12 Describe the binary number system.
	02.13 Convert decimal numbers to binary and vice versa.
	02.14 Perform binary math operations, such as add, subtract, multiply, and divide.
	02.15 Explain binary algebra.
	02.16 Explain the hexadecimal and octal number systems.
	02.17 Convert binary numbers to hexadecimal or octal numbers and vice versa.
	02.18 Explain the binary coded decimal number system and its use.
	02.19 Convert decimal numbers to binary coded decimals.
	02.20 Explain the Gray code number system and its use.
	02.21 Explain the ASCII and EBCDIC alphanumeric codes.
03.0	Prepare multi-view drawings. The student will be able to:
	03.01 Explain the principles of orthographic projection.
	03.02 Describe how measurements are transferred from view to view.
	03.03 Identify and explain projection planes and how they relate to multi-view drawings.
	03.04 Determine the necessary views to completely describe an object in a multi-view drawing.
	03.05 Prepare multi-view scaled drawings using orthographic projection.

	03.06 Prepare drawings using general and local notes.
	03.07 Select proper plot drawing scale, views and layout.
04.0	Prepare auxiliary drawings. The student will be able to:
	04.01 Explain the projection procedures for the creation of auxiliary views.
	04.02 Explain why an auxiliary view is constructed perpendicular to an angular surface.
	04.03 Prepare drawings containing primary auxiliary views.
	04.04 Prepare drawings containing auxiliary views that include curved lines.
05.0	Apply basic dimensioning. The student will be able to:
	05.01 Explain why dimensions and notes are needed on drawings.
	05.02 Identify, explain, and accurately use the two systems of linear measurement to dimension drawings.
	05.03 Prepare drawings containing linear, angular and circular standard dimensions.
	05.04 Dimension cylinders, holes, arcs, and angles.
	05.05 Apply the general rules for dimensioning inch and/or metric drawings.
	05.06 Explain the methods used in the conversion to metric dimensioning from conventional inch dimensioning.
	05.07 Prepare drawings using metric dimensions.
	05.08 Understand and demonstrate tolerance dimensioning.
	05.09 Describe the basic principles of geometric dimensioning and tolerancing.
	05.10 Explain how dimensions are generated in computer-aided drafting.
06.0	Prepare pictorial drawings. The student will be able to:
	06.01 Define pictorial drawings.
	06.02 Identify and compare isometric and oblique pictorial drawings.
	06.03 Understand the geometric layout of an isometric view.
	06.04 Use snap setting, function keys and crosshairs rotate an isometric plane orientation to assist drawing objects in isometric angles.

	06.05 Illustrate one-point and two-point perspectives.
	06.06 Produce a pictorial drawing of a mechanical device in a separate viewport describing an orthogonal projection drawing.
	06.07 Explain how CAD and Modeling have impacted the creation of pictorial drawings.
07.0	Prepare surface developments. The student will be able to:
	07.01 Define pattern development.
	07.02 Describe the parallel line and radial line development methods.
	07.03 Explain what a wired edge, hem, and seam are and why they are used.
	07.04 Determine the bend allowance to properly dimension a flat pattern drawing in precision sheet metal work.
	07.05 Construct developments of a prism, a cylinder, a cone and a pyramid.
	07.06 Create developments of a transition piece.
	07.07 Produce assembly drawing involving intersecting pieces.
08.0	Prepare basic computer-aided architectural drawings. The student will be able to:
	08.01 Explain the importance of architectural plans.
	08.02 List the types of information required when building a home.
	08.03 Identify the types of plans in a set of architectural drawings.
	08.04 Produce a site plan using the computer.
	08.05 Produce a floor plan using the computer.
	08.06 Design a roof plan using the computer.
	08.07 Create a 2D drawing indicating the elevations for the project.
	08.08 Illustrate a typical wall section and identify individual components.
09.0	Demonstrate basic electrical/electronic literacy. The student will be able to:
	09.01 Differentiate a basic understanding of electrical and electronics drafting.
	09.02 Explain why electrical and electronics drafting is diagrammatic in nature.

09.03	List the rules for creating accurate block, flow, single-line electronic and Process Instrumentation Derivative (PID) diagrams.
09.04	Draw a block diagram, flow diagram, single line diagram.
09.05	Identify electrical/electronic symbols per ANSI Y32.2, *Electrical and Electronics Diagrams* (used for ANSI Y32.14).
09.06	Identify electrical/electronic symbols per ANSI Y-32.14, *Logic Diagrams, Graphic Symbols*
09.07	Prepare schematic/block diagrams and/or electrical plans.
09.08	List and describe the common types of diagrams used in the industry.
09.09	Describe the use of CAD in electrical and electronics drafting.
09.10	Identify the electrical symbols for various pushbuttons and switches.
09.11	Describe the operation of proximity, Hall Effect, RADAR, LIDAR, and ultrasonic sensors.
09.12	Describe the history, development and use of Programmable Logic Controllers (PLC).
09.13	Name the common indicators used in PLC systems.
09.14	Explain the purpose of using indicators in a PLC system.
09.15	Explain the difference between a power relay and a control relay.
09.16	Describe the operation of a relay and a solenoid.
09.17	Name the two major types of motor control devices.
09.18	Name two types of overload relays.
10.0	Perform basic computer-aided drawing functions. The student will be able to:
10.01	Explain the value of planning your work and systems management procedures.
10.02	Identify title blocks, revision history blocks, parts lists, bills of materials and schedules using attributes and dynamic blocks.
10.03	Prepare drawing set up using templates, layouts and title blocks, external referenced backgrounds and x-referenced title blocks.
10.04	Construct geometric figures of lines, splines, circles and arcs, polylines, multiline, donuts and ellipses.
10.05	Develop and use text styles and edit text and size to annotate drawings.
10.06	Differentiate between .SHX and .TTF font extensions.

10.07	Use and control accuracy enhancement tools for entity positioning methods such as 2D and 3Dsnap and XYZ.
10.08	Identify, create, store and use standard part symbols and libraries, files for tool palettes.
10.09	Create attribute definitions.
10.10	Create blocks that contain attributes.
10.11	Insert blocks with attributes into a drawing.
10.12	Edit attribute values in existing blocks.
10.13	Edit single and multiple attribute references.
10.14	Display attribute values in fields.
10.15	Create and modify table styles.
10.16	Insert tables into a drawing.
10.17	Edit tables.
10.18	Differentiate between data extraction and object linking.
10.19	Use existing data entered in an electronic spreadsheet or Comma-Separated Value (CSV) file to create or update CAD tables.
10.20	Use data extraction procedure to reuse data from an existing CAD drawing content to create a table.
10.21	Understand how extracted data objects or linked data in the tabular format is changed and data is written back to the original file.
10.22	Utilize editing commands.
10.23	Control entity properties by layer, color and line type.
10.24	Use viewing commands to perform zooming and panning.
10.25	Create saved page setups for plotting to different plotters and sizes of paper.
10.26	Select Browse for Plot File dialog box to create Drawing Web Format or .PDF drawing output files.
10.27	Create a border information block to populate an external referenced title block including multiline attribute for sheet titles.
10.28	Differentiate between attached or overlay processes with external references.
10.29	Explain the function of the VISRETAIN variable as it relates to external reference a layering scheme.

	10.30 Create a drawing with external references and two viewports of different scales.
	10.31 Explain how to switch between viewports.
	10.32 Define dimscale and associated scale settings associated with individual viewports.
	10.33 Apply standard dimensioning rules per discipline.
11.0	Explain the importance of employability and entrepreneurship skills. The student will be able to:
	11.01 Identify and demonstrate positive work behaviors needed to be employable.
	11.02 Develop personal career plan that includes goals, objectives and strategies.
	11.03 Examine licensing, certification and industry credentialing requirements.
	11.04 Maintain a career portfolio to document knowledge, skills and experience.
	11.05 Evaluate and compare employment opportunities that match career goals.
	11.06 Identify and exhibit traits for retaining employment.
	11.07 Identify opportunities and research requirements for career advancement.
	11.08 Research the benefits of ongoing professional development.
	11.09 Examine and describe entrepreneurship opportunities as a career planning option.
	11.10 Demonstrate knowledge of the "Right-To-Know Law" as recorded in (29 CFR-1910.1200).
12.0	Prepare basic computer-aided two-dimensional architectural drawings. The student will be able to:
	12.01 List the information required on a typical floor plan.
	12.02 Create and dimension a 2D floor plan.
	12.03 Determine diametric interior and exterior elevation and section views.
	12.04 Establish perspective exterior views.
13.0	Prepare basic computer-aided two-dimensional architectural multi-level drawings for a residential project. The student will be able to:
	13.01 Produce a 2D first floor plan.
	13.02 Produce a 2D second floor plan.

	13.03 Design basic roof framing layout drawing.
	13.04 Create four exterior elevations using the computer using different viewports with varied scale configurations.
	13.05 Construct a second floor framing plan.
14.0	Prepare a basic two-dimensional plot plan drawing for a residential project. The student will be able to:
	14.01 Layout a 2D residential plot.
	14.02 Indicate plot size and limits.
	14.03 Indicate plot orientation.
	14.04 Layout a public street and sidewalk.
	14.05 Locate building setback lines and public utility easements.
	14.06 Write a plot legal description.
	14.07 Dimension a building location.
	14.08 Layout and label specialty features (patio/pool/gazebo).
15.0	Prepare a basic two-dimensional landscape plan drawing for a residential project. The student will be able to:
	15.01 Develop a list of landscape symbols.
	15.02 Layout landscape features.
	15.03 Develop a schedule of plants/shrubs.
16.0	Prepare computer-aided mechanical working drawings. The student will be able to:
	16.01 Produce dimensioned multi-view drawings applying CAD techniques.
	16.02 Name the six Two Dimensional (2D) views possible in orthographic projection.
	16.03 Create construction lines using the XLINE and RAY commands as a drawing aid to align the objects in each view.
17.0	Prepare computer-aided three-dimensional mechanical drawings. The student will be able to:
	17.01 Describe three differences between parametric modeling and traditional 2D computer-aided drafting techniques.
	17.02 Describe how the parametric modeling approach conforms to the design philosophy of “shape before size.”

	17.03 Use design intent as evidenced using parametric modeling, geometric and dimensional constraints, relational parametric equations.
	17.04 Describe how parametric modeling updates entire systems by changing one parameter of complex designs.
	17.05 Discuss the principles behind solid and surface modeling techniques.
	17.06 Discuss techniques for creating accurate 3D model features.
	17.07 Discuss detailed uses of 3D coordinates, user coordinate systems, and viewports.
	17.08 Use various techniques for editing 3D objects.
	17.09 Follow guidelines for using text in 3D drawings.
	17.10 Select CAD software tools available for creating drawing views.
	17.11 Identify methods for assigning materials, creating lights, and setting up scenes for rendering.
	17.12 Describe animation tools and techniques used in CAD software.
	17.13 Demonstrate understanding in sharing coordinates between 3D models, acquiring and reacquiring shared coordinates.
18.0	Prepare a typical two-dimensional wall section for a residence. The student will be able to:
	18.01 Produce a two-story residential wall section.
	18.02 Apply notes and dimensions to residential wall section.
19.0	Prepare a basic foundation plan drawing for a residential project. The student will be able to:
	19.01 Produce a foundation plan drawing for a residence.
	19.02 Generate foundation detail drawings.
20.0	Prepare a basic electrical plan drawing for a residential structure. The student will be able to:
	20.01 Design an electrical plan for a residence.
	20.02 Apply electrical symbols legend to electrical plan.
	20.03 Create the one-line and corresponding riser diagram for a residence.
	20.04 Distinguish the difference between panel and feeder schedules used in architectural plans.
21.0	Prepare a basic heating, ventilation and air-conditioning (HVAC) plan drawing for a residential structure--The student will be able to:

	21.01 List features included on a residential climate control plan.
	21.02 Estimate the ductwork for a typical forced-air system.
	21.03 Compute an appropriate heating or cooling unit for a given structure.
	21.04 Categorize HVAC symbols and legend for a HVAC plan.
	21.05 Produce a HVAC plan for a residence.
	21.06 Explain types of HVAC schedules used in residential and commercial architecture plans.
22.0	Prepare a basic two dimensional and isometric plumbing plan drawing for a residential structure. The student will be able to:
	22.01 Explain the purpose of a residential plumbing system.
	22.02 Identify the elements contained in a residential water supply system.
	22.03 Identify the elements in a water and waste removal system.
	22.04 Explain the layout of a private sewage disposal system.
	22.05 Develop a plumbing plan for a residence.
	22.06 Create plumbing symbols and legend for a plumbing plan.
	22.07 Create single-line plumbing isometric riser diagrams indicating domestic water and waste venting of overhead runs.
	22.08 Discuss considerations related to healthy architectural design and construction.
	22.09 Explain considerations related to hazardous waste disposal and storage.
23.0	Demonstrate mathematics knowledge and skills. The student will be able to:
	23.01 Analyze and apply data and measurements to solve problems and interpret documents.
	23.02 Create formulas in table cells to perform calculations.
	23.03 Generate expressions with common operators used for mathematical expressions.
	23.04 Calculate sum, average or count of a range of cells in a tabular format.

Course Number: TDR0302 Occupational Completion Point: B CAD & Modeling II – 450 Hours	
24.0	Prepare computer-aided 3D architectural drawings using building information modeling (BIM) tools. The student will be able to:
24.01	Explain the concept of building information modeling (BIM).
24.02	Explain the difference between sustainability and green building.
24.03	List seven major sustainable design concepts and explain how they apply to residential design.
24.04	Create a floor plan.
24.05	Generate isometric, diametric, interior and exterior views.
24.06	Select perspective exterior views.
25.0	Prepare advanced computer-aided 3D architectural multi-level drawings for a residential BIM project. The student will be able to:
25.01	Produce a first floor plan from the residential BIM model.
25.02	Produce a second floor plan from the project model.
25.03	Produce two-story interior and exterior elevation drawings by positioning markers appropriately.
26.0	Prepare an advanced three-dimensional site plan drawing. The student will be able to:
26.01	Layout an advanced 3D residential site plan using topographical elevation data.
26.02	Indicate plot size and limits.
26.03	Indicate plot orientation.
26.04	Dimension building location.
26.05	Identify national certification programs including Leadership in Energy & Environmental Design (LEED) Green Building ratings.
27.0	Prepare an advanced landscape plan drawing. The student will be able to:
27.01	Categorize a list of landscape symbols using attributes.
27.02	Layout advanced landscape features in a site plan.
27.03	Develop a schedule of plants/shrubs in tabular format.

28.0	Prepare an advanced wall section using building information modeling. The student will be able to:
	28.01 Produce an advanced two-story residential wall section through section marker positioning on the floor plan.
	28.02 Apply notes and dimensions to an advanced residential wall section.
29.0	Prepare an advanced drawing of a foundation plan for a residential BIM project. The student will be able to:
	29.01 Produce an advanced foundation plan drawing for a residence.
	29.02 Create advanced foundation detail drawings.
30.0	Prepare an advanced drawing of an electrical plan for a residential BIM project. The student will be able to:
	30.01 Design an advanced electrical plan for a residence.
	30.02 Apply electrical symbols and legend for an advanced electrical plan.
31.0	Prepare advanced drawing of a heating, ventilation and air-conditioning (HVAC) plan for residential BIM project. The student will be able to:
	31.01 Categorize HVAC symbols and legend for an advanced HVAC plan.
	31.02 Produce an advanced HVAC plan for a residence.
32.0	Prepare an advanced drawing of a plumbing plan for a residential BIM project. The student will be able to:
	32.01 Categorize plumbing symbols and legend for an advanced plumbing plan.
	32.02 Produce an advanced plumbing plan for a residence.

NOTE: Students may choose one of the following courses for the completion of OCP C: TDR0303, TDR0305 or TDR0306

Course Number: TDR0303 Occupational Completion Point: C – Option 1 Building Information Modeling CAD Technician – 300 Hours	
33.0	Prepare computer-aided 3D architectural commercial drawings using building information modeling tools. The student will be able to:
	33.01 Explain the principles of building information modeling (BIM).
	33.02 Describe the characteristics of a BIM model.
	33.03 List and describe major BIM processes used in a building project.

	33.04 Explain the common tools and processes used in parametric modeling.
	33.05 Describe common processes used to coordinate models between different engineering disciplines.
	33.06 Explain applications for a BIM model in facility management.
	33.07 Explain the common tools and processes used in parametric modeling.
	33.08 Interpret catalogs, specifications, technical tables, codes and ordinances for commercial buildings.
	33.09 Draw floor plans for a commercial building.
	33.10 Draw diametric interior and exterior elevations for a commercial building**.**
	33.11 Draw perspective exterior views for a commercial building.
	33.12 Apply notes and dimensions to wall section for a commercial building.
34.0	Prepare an advanced drawing of the foundation and footing plan for a commercial BIM project. The student will be able to:
	34.01 Produce an advanced dimensioned foundation and footing plan drawing for a commercial building.
	34.02 Create advanced foundation detail drawings for a commercial building.
35.0	Prepare advanced electrical plans for a commercial BIM project. The student will be able to:
	35.01 Produce advanced electrical plans for a multi-story commercial building**.**
	35.02 Apply electrical symbols legend to advanced electrical plans.
36.0	Prepare three-dimensional presentation drawings for a commercial BIM project. The student will be able to:
	36.01 Produce color pictorial drawings for a commercial building.
	36.02 Generate dynamic presentation views or walk-throughs.
	36.03 Create a drawing portfolio of a commercial BIM project.
37.0	Prepare structural details for a commercial BIM project. The student will be able to:
	37.01 Interpret structural manuals and technical tables.
	37.02 Draw structural connections.
	37.03 Create a graphical column schedule for a commercial BIM project.

38.0	Prepare structural steel drawings for a commercial BIM project. The student will be able to:
38.01	Interpret codes and American Institute of Steel Construction (AISC) specifications.
38.02	Use the Manual of Steel Construction and other technical data.
38.03	Explain the product fabrication processes for structural steel.
38.04	Calculate reactions and stresses.
38.05	Perform weight calculations for structural steel.
38.06	Interpret shear and moment diagrams.
38.07	Explain the application of bolted, welded, riveted, split-ring, and shear-plate in heavy construction.
38.08	Detail bolted connections.
38.09	Detail welded connections.
38.10	Detail complete structural steel baseplate, framed and seated connections.
38.11	Produce erection plans and schedules.
38.12	Determine an advanced bill for ordering materials.
38.13	Interpret common welding symbols.
38.14	Produce properly constructed structural steel framing plans according to engineering specifications.
39.0	Prepare reinforced concrete drawings for a commercial BIM project. The student will be able to:
39.01	Identify four basic types of framing plans in precast concrete framing plans.
39.02	Interpret codes and specifications per current American Concrete Institute (ACI) standards.
39.03	Interpret engineering drawings and shop drawings for a set of precast concrete structural working drawings.
39.04	Identify product schedules found in framing plans.
39.05	Define precast concrete sections.
39.06	Create an annotated example of a typical section cutting symbol.
39.07	Identify the rules for assigning mark numbers.

	39.08 Produce precast concrete full, partial, and offset sections in precast concrete working drawings.
	39.09 Create column detail drawings.
	39.10 Produce footing and foundation drawings for a commercial building.
	39.11 Create floor and roof detail drawings for a commercial building.
	39.12 Create special structure detail drawings for a commercial building.
	39.13 Determine a reinforcing bar list and schedule.
	39.14 Define poured-in-place concrete construction.
	39.15 Define engineering drawings and placing drawings as used in poured-in-place concrete drafting.
	39.16 Identify common abbreviations and symbols used in poured-in-place drawings.
	39.17 Assign and interpret mark numbers for structural concrete members.
	39.18 Produce engineering and placing drawings for poured-in-place concrete foundations.
	39.19 Produce engineering and placing drawings for poured-in-place concrete wall systems, components and concrete columns
	39.20 List the four basic categories of poured-in-place concrete walls and identify methods for each category.
	39.21 Perform cubic yard calculations for concrete.
40.0	Prepare structural wood drawings for a commercial BIM project. The student will be able to:
	40.01 Identify the four most common materials used in the construction of residential and commercial building.
	40.02 Identify qualities that make these materials environmentally friendly.
	40.03 Cite the four common framing systems used with wood construction.
	40.04 Interpret codes and specifications.
	40.05 Create fastening and connection details.
	40.06 Produce framing plans.
	40.07 Perform board feet calculations for structural wood.
41.0	Prepare advanced three-dimensional computer-aided drawings for a commercial BIM project--The student will be able to:

	41.01 Produce advanced 3D CAD drawings for a commercial building**.**
42.0	Prepare advanced heating, ventilation and air-conditioning (HVAC) plans for a commercial BIM project. The student will be able to:
	42.01 Explain the purpose and function of HVAC systems.
	42.02 Produce advanced HVAC drawings for a commercial building including plans, schedules and details.
	42.03 Construct a HVAC symbols legend for a HVAC plan.
	42.04 Create sheet metal pattern developments and intersections.
	42.05 Calculate and apply bend allowances to sheet metal components.
	42.06 Reconstruct and completely dimension precision sheet metal fabrication drawings.
43.0	Prepare advanced plumbing plan drawings for a commercial BIM project. The student will be able to:
	43.01 Interpret the different kinds of pipe and their uses.
	43.02 Interpret the methods of pipe connections and particular applications.
	43.03 Identify pipe fittings and valves.
	43.04 Produce dimensioned, single-line and double-line piping drawings using pipe fittings and valves.
	43.05 Translate piping riser diagrams and spool drawings using piping plans and elevations.
	43.06 Produce advanced plumbing plans for a commercial building.
	43.07 Classify a plumbing symbols legend for commercial plumbing plan.

NOTE: Students may choose one of the following courses for the completion of OCP C: TDR0303, TDR0305 or TDR0306

Course Number: TDR0306 Occupational Completion Point: C – Option 2 Civil/Geographic Information Systems CAD Technician – 300 Hours	
44.0	Demonstrate understanding of basic civil drawings. The student will be able to:
	44.01 Describe how sustainable sites/landscaping offer innovation in the application of resources needed to create the built environment.
	44.02 Understand civil terminology.

	44.03 Read and interpret civil drawings.
	44.04 Prepare civil plans with topography and profile drawing.
45.0	Prepare computer-aided map details. The student will be able to:
	45.01 Produce a map using bearings.
	45.02 Produce a map using coordinates.
	45.03 Convert map into metric dimensions.
46.0	Understand surveying and mapping procedures. The student will be able to:
	46.01 Analyze basic mapping specifications.
	46.02 Interpret aerial photogrammetry.
	46.03 Identify horizontal measures.
	46.04 Identify leveling procedures.
	46.05 Interpret angular measurements and quantify results in addition and subtraction of bearings and azimuths in boundary surveys.
	46.06 Interpret legal descriptions.
47.0	Prepare advanced map drawings. The student will be able to:
	47.01 Compile traverse drawings.
	47.02 Produce street layout drawings using alignments.
	47.03 Create advanced map drawings.
	47.04 Construct highway drawings featuring intersections.
	47.05 Generate topographic drawings.
48.0	Prepare advanced civil drawings. The student will be able to:
	48.01 Devise drainage drawings designed for storm water run-off.
	48.02 Produce plat drawings indicating building setback lines and public utility easements.
	48.03 Generate advanced plan and profile drawings.

	48.04 Create utility drawings.
49.0	Demonstrate an understanding of geographic coordinate systems. The student will be able to:
	49.01 Differentiate between different models for the shape of the earth.
	49.02 Describe the characteristics of a global coordinate system.
	49.03 Describe the characteristics of geographic datum.
	49.04 Compare and contrast different map projections.
	49.05 Detail the characteristic of the Cartesian coordinate system.
	49.06 Detail the Universal Transverse Mercator (UTM), universal polar stereographic (UPS) and State Plane coordinate systems.
	49.07 Find and organize geographic data and other content for mapping projects.
	49.08 Share GIS maps and analysis results so they are easily accessible to desktop, web, and mobile device users.
	49.09 Accurately display features on Geographic Information System (GIS) maps and access information about them.
	49.10 Plan cartographic projects.
50.0	Perform map creation activities. The student will be able to:
	50.01 Create and share GIS maps.
	50.02 Set the appropriate geographic coordinate system for maps in the GIS application.
	50.03 Add geographic data layers to a GIS application.
	50.04 Manipulate data files that do not align correctly.
	50.05 Symbolize each layer appropriately.
	50.06 Label map features as needed.
	50.07 Add map components such as legends, titles, scale bars, north arrows.
	50.08 Publish the complete map in paper and electronic formats.
51.0	Perform GIS data file creation activities. The student will be able to:
	51.01 Subset existing GIS data files to create new files.

	51.02 Combine existing, adjacent GIS data files together to create new files.
	51.03 Collect coordinate information using a Global Positioning System (GPS) receiver in the correct geographical coordinate system.
	51.04 Create new GIS data files using coordinate information.
	51.05 Register aerial photographs or satellite images to a specific geographical coordinate system.
	51.06 Create new GIS data files by digitizing on top of registered images.
52.0	Perform GIS data file manipulation activities. The student will be able to:
	52.01 Create, delete and move GIS files between folders and computers.
	52.02 Import metadata into GIS files.
	52.03 Set coordinate system information for a GIS file.
	52.04 Reproject GIS files to different coordinate systems.
	52.05 Rectifying / rubber-sheeting arbitrary coordinate systems into defined coordinate systems.
	52.06 Create appropriate geodatabase structures to organize data for efficient storage, display, and editing.
	52.07 Add and delete fields in a GIS database.
	52.08 Manipulate values of fields within a GIS database.
	52.09 Choose appropriate data, methods, and tools to plan, execute, and document a given analysis project.
53.0	Perform GIS spatial analysis activities. The student will be able to:
	53.01 Generalize maps by merging adjacent areas if they contain the same or similar attributes.
	53.02 Overlay GIS files that cover the same area to create new files.
	53.03 Create buffers around map features.
	53.04 Manipulate Digital Elevation Models (DEM's) to create slope, aspect, view shed and hill shade layers.
	53.05 Create density maps from point features.
	53.06 Interpolate point features to create continuous surfaces.
	53.07 Generate spatial statistics on GIS files.

	53.08 Interpret spatial analysis to answer questions and create new information.
	53.09 Add rules and behaviors to ensure the spatial and attribute integrity of geographic data.
54.0	Perform database operations. The student will be able to:
	54.01 Build a relational database.
	54.02 Query, display and format data.
	54.03 Save, retrieve and run queries.
	54.04 Build and format reports.
	54.05 Group and summarize data.
	54.06 Insert, update, automatically generate and delete data.
	54.07 Control transaction processing.
	54.08 Create, confirm, modify and remove tables to store data.
	54.09 Apply business rules to ensure data integrity.
	54.10 Restrict user access to tables.
	54.11 Improve query performance.
	54.12 Develop programs using Structured Query Language (SQL).
	54.13 Insert and manipulate data with SQL.
	54.14 Choose appropriate data to support cartographic needs.
55.0	Engage in project planning activities to expedite the completion of civil drafting projects. The student will be able to:
	55.01 Understand requirements to schedule and plan for civil project tasks including mitigation as a result of impact on the environment.
	55.02 Understand the processes to network with stakeholders to manage budgets, resources, and deadlines.
	55.03 Produce project deliverables per phasing and negotiated obligations.

NOTE: Students may choose one of the following courses for the completion of OCP C: TDR0303, TDR0305 or TDR0306

Course Number: TDR0305 Occupational Completion Point: C – Option 3 Mechanical CAD Technician – 300 Hours	
56.0	Prepare advanced mechanical drawings. The student will be able to:
56.01	Create extruded solid models.
56.02	Understand the basic parametric modeling procedure.
56.03	Create 2D sketches.
56.04	Indicate the Engineering Change Orders (ECO's) procedure used in mechanical drawing revision documentation.
56.05	Make engineering changes on drawings.
56.06	Create and edit parametric dimensions.
56.07	Understand constructive solid geometry concepts.
56.08	Create a binary tree.
56.09	Understand the basic boolean operations.
56.10	Understand the importance of the Order of Features.
56.11	Understand the concept and usage of the Base, Origin, Root, Note (BORN) technique.
56.12	Understand the importance of Parent/Child Relations in features.
56.13	Create drawing layouts from solid models.
56.14	Identify the various manufacturing methods.
56.15	Use precision dimensioning to include Geometric Dimensioning and Tolerancing (GDT) for fits and finishing.
56.16	Construct fastener drawings.
56.17	Generate a cam drawing with dimensions.
56.18	Identify diagrams that explain the shape and size of cams.
56.19	Explain terminology related to cams.

	56.20 Understand the meaning and draw a cam displacement drawing.
	56.21 Identify three types of gears with the individual representations and specifications.
	56.22 Create a gear drawing with dimensions.
	56.23 Create a Geneva Cam assembly with housing and produce a 3D print or animation of the working mechanism.
	56.24 Produce a spring drawing with dimensions.
57.0	Prepare production drawings using 3D CAD techniques. The student will be able to:
	57.01 Generate pattern shop detail drawings.
	57.02 Reconstruct casting drawings.
	57.03 Make forging detail drawings.
	57.04 Generate machining detail drawings.
	57.05 Create 3D stamping drawings.
	57.06 Make 3D welding drawings.
	57.07 Construct installation drawings.
	57.08 Generate a Bill of Materials (BOM) using attributes and tabular format within a drawing.
	57.09 Export tables to an external database or an electronic spreadsheet.
58.0	Prepare tool drawings using 3D CAD techniques. The student will be able to:
	58.01 Produce 3D jig and fixture drawings.
	58.02 Create 3D cutting die drawings.
	58.03 Design 3D forming die drawings.
59.0	Engage in project planning activities to expedite the completion of mechanical drafting projects--The student will be able to:
	59.01 Understand what it takes to schedule and plan mechanical project tasks.
	59.02 Define Just-In-Time communication and explain how it optimizes factory and plant operations.
	59.03 Define Supervisory Control and Data Acquisition (SCADA) and state the functional tasks involved with automation systems.

59.04	Identify industrial electrical symbols for various pushbuttons, switches, relays and indicators.
59.05	Describe the types of temperature sensors used in industrial settings.
59.06	Explain the difference between a power relay and a control relay.
59.07	Name the common indicators used in Programmable Logic Controller (PLC) systems.
59.08	Explain the purpose of using indicators in a PLC system.
59.09	Describe the operations of a relay and solenoid.
59.10	Indicate the sequence of operation of a given application.
59.11	Name the two major types of motor control devices.
59.12	Name two types of overload relays.
59.13	Use symbols to represent different types of input and output devices.
59.14	Create relay logic diagrams using the standard relay logic rules.
59.15	Create relay logic circuits for process and industrial control problems.
59.16	List the rules for creating a PLC ladder logic diagram.
59.17	Convert a relay logic diagram to a PLC ladder logic diagram.
59.18	Use the force instruction for troubleshooting.
59.19	Describe combinational and sequential logic gate circuits.
59.20	Create PLC ladder logic programs for NOT, AND, OR, NAND, NOR, XOR, and XNOR logic gates.
59.21	Create Boolean expressions and logic gate circuits from truth tables.
59.22	Simplify Boolean expressions.
59.23	Convert Boolean expressions to PLC ladder logic diagrams.
59.24	Convert PLC ladder logic diagrams to logic gate circuits and Boolean expressions.
59.25	Use timer and counter instructions to create PLC ladder logic diagrams.
59.26	Program the add, subtract, multiply and divide instructions into the PLC ladder logic diagram.

	59.27 Explain the meaning of PLC indicator lights.
	59.28 Use forced instructions to check PLC input and output ports.
	59.29 Name the common devices used in a PLC network.
	59.30 Describe the three main elements of a PLC network.
	59.31 Explain the relationship between programs, tasks, and routines.
	59.32 PLC programming to achieve PLC control of various industries.
	59.33 Understand how to network with stakeholders to manage budgets, resources and deadlines.
	59.34 Produce project deliverables per phasing and negotiated obligations.
60.0	Prepare advanced modeling analysis using Finite Element Method (FEM) techniques. The student will be able to:
	60.01 Define the Finite Element Method (FEM).
	60.02 Describe FEM through variational formulation, a discretization strategy, solution algorithm(s) and post-processing procedures.
	60.03 Understand the difference between dynamics and statics process in mathematical terms needed to solve simulations.
	60.04 Explain how stresses are calculated using linear static analysis based on the finite element method.
	60.05 Understand general theory of Finite Element Analysis (FEA).
	60.06 Identify the general procedures that are necessary to carry out an analysis.
	60.07 Quantify the accuracy (or inaccuracy) of the analysis with reasonable success.
	60.08 Perform comprehensive evaluation and checking when interpreting results.
	60.09 Understand the overall physics and engineering of the problem to be solved, and the loads and boundary conditions to apply.
	60.10 Identify the relevant material properties and the different reactions to boundary conditions of the model.
	60.11 Use the appropriate material type for linear analyses, including isotropic material, orthotropic and anisotropic element shell definitions.
	60.12 Clarify what the problem is, what is being modeled and formulate a systematic plan of analysis.
	60.13 Understand requirements of any particular design intent and the circumstance(s) as to which form(s) of analysis is required to solve.
	60.14 Consider manufacturing and operating environments of a product and how the factors might impinge on the performance.

60.15	Understand how a product reacts to various physical effects and which analysis is utilized given specific parameters.
60.16	Know relationships between elements, element nodes and how interpolation is based on all possible support and load scenarios.
60.17	Understand how each node is described by a number of parameters depending on the analysis type and the element used.
60.18	Understand in structural analysis how the response of a node is described by the degrees of freedom for each occurrence.
60.19	Perform a typical Linear Stress Analysis systematic description of components of FEM programs.
60.20	Integrate the resultant components to facilitate problem solving the workflow for a FEA process model.
60.21	Create 3-dimensional model geometry.
60.22	Assign physical material properties.
60.23	Create a mesh of the model.
60.24	Apply loads and constraints.
60.25	Run the simulation.
60.26	Generate a report and review results.
60.27	Describe how results of FEA can be presented in various forms including x-y plots and contour plots.
60.28	Determine if design changes are required to reduce the chance of failure, improve performance, or optimize for cost; use the results.
60.29	Examine licensing, certification and industry credentialing requirements, specifically Professional Simulation Engineer certification.
60.30	Present basic information that is necessary for the safe use of finite element analysis.
60.31	Understand the qualification of assumption is the key to the successful use of finite element analysis in any product design.

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 co-curricular career and technical student organization(s) 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.

Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Heating, Ventilation, Air-Conditioning/Refrigeration (HVAC/R)**
Program Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

Career Certificate Program		
Program Number	C400400	
CIP Number	0615050110	
Grade Level	30, 31	
Program Length	1350 Hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 10	Communications (Reading and Language Arts): 9

Purpose

The purpose of this program is to prepare students for employment or advanced training in the heating, ventilation, air-conditioning/refrigeration (HVAC/R) industry. The student should obtain EPA certification prior to leaving school in order to be employed in any job that requires work with refrigerants. This program focuses on broad, transferable skills, stresses the understanding of the heating, air-conditioning, refrigeration and ventilation industry and demonstrates elements of the industry such as planning, management, finance, technical and production skills, the underlying principles of technology, and health, safety and environmental issues.

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 designing, testing and repairing heating, ventilation, air-conditioning/refrigeration (HVAC/R) systems.

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 five occupational completion points.

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

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	ACR0000	Introduction to HVAC/R	AC HEAT ME @7 7G REFRG MECH 7 G	250 Hours
B	ACR0001	HVAC/R Fundamentals		250 Hours
C	ACR0012	HVAC/R Service Practices		250 Hours
D	ACR0013	HVAC/R Intermediate Service Practices		250 Hours
E	ACR0044 **OR** ACR0045	HVAC/R Advanced Service Practices (formerly 'Air-Conditioning, Refrigeration and Heating Technician')* **OR** HVAC/R Advanced Commercial and Industrial Service Practices (formerly 'Refrigeration Mechanic')*		350 Hours **OR** 350 Hours

***NOTE: Students may choose one of the following courses for the completion of OCP E: ACR0044 or ACR0045**

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

Introduction to HVAC/R

01.0 Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
02.0 Explain the importance of employability, soft skills, entrepreneurship skills and making career plans.
03.0 Identify, use and maintain the tools and tool accessories used in the heating, air-conditioning and refrigeration industry.
04.0 Demonstrate mathematics knowledge and skills.
05.0 Explain the properties of matter and heat behavior.
06.0 Describe the history and concepts of heating, air-conditioning and refrigeration.
07.0 Analyze fluids, pressures, refrigerants and related codes.
08.0 Evaluate heating, air-conditioning and refrigeration system components and accessories.
09.0 Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning & refrigeration industry.
10.0 Utilize and operate mechanical refrigeration servicing and testing equipment.

HVAC/R Fundamentals

11.0 Demonstrate a practical knowledge of basic electricity and of the electrical components of heating, air-conditioning and refrigeration equipment.
12.0 Demonstrate knowledge of electrical wiring in air-conditioning and refrigeration.
13.0 Troubleshoot heating, air-conditioning and refrigeration electrical control systems and their components.
14.0 Select and test electrical generation and distribution components for commercial heating and air conditioning systems.
15.0 Maintain, test and troubleshoot electrical motors and their components for commercial heating and air-conditioning systems.

HVAC/R Service Practices

16.0 Utilize mechanical components of heating air-conditioning and refrigeration systems.
17.0 Operate solid-state electronics as used in heating, air-conditioning and refrigeration systems.
18.0 Read construction documents.
19.0 Assist in the installation of a residential heating and air-conditioning system and determine start-up procedures.
20.0 Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems.
21.0 Use combustion-type heating servicing and testing equipment.
22.0 Troubleshoot combustion gas valves and regulators as used in heating, air-conditioning, refrigeration and ventilation systems.
23.0 Understand the design of heating and cooling systems.
24.0 (Optional) Explain the importance of employability, soft skills, entrepreneurship skills and making career plans.

HVAC/R Intermediate Service Practices

25.0 Select appropriate commercial compressors.
26.0 Test and adjust commercial evaporative condensers.
27.0 Maintain, test and troubleshoot commercial evaporators.

28.0 Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing.
29.0 Maintain, troubleshoot and repair commercial heating systems.
30.0 Discuss new HVAC/R technologies.
31.0 Interpret, use and modify construction drawings and specifications.
32.0 Troubleshoot and repair commercial heating and air-conditioning systems.

HVAC/R Advanced Service Practices (option 1)
33.0 Develop an understanding of hydronic systems.
34.0 Determine the properties of air.
35.0 Use a pressure enthalpy chart to diagram refrigerant cycles.
36.0 Explain the standards for and ways to measure indoor air quality.
37.0 (Optional) Identify and understand pneumatic control systems for commercial heating and air-conditioning applications.
38.0 Develop an understanding of chilled systems.
39.0 (Optional) Maintain and repair thermal storage systems.
40.0 Understand and explain the calculation of commercial heating and air-conditioning loads.
41.0 Balance an air distribution system.
42.0 Select energy conservation equipment.
43.0 Analyze building management systems.
44.0 (Optional) Recommend alternative heating and cooling systems for various case studies.

HVAC/R Advanced Commercial and Industrial Service Practices (option 2)
45.0 Demonstrate knowledge of retail refrigeration systems.
46.0 Demonstrate knowledge of commercial and industrial refrigeration systems.
47.0 Demonstrate a working knowledge of electrical generation and distribution components for commercial heating and air conditioning systems.
48.0 Demonstrate a working knowledge of refrigeration system vibration and insulation.
49.0 Apply commercial refrigeration pipe sizing and troubleshooting procedures.
50.0 Use refrigeration systems skills in commercial applications.
51.0 Demonstrate a working knowledge of refrigerated storage systems.
52.0 Diagnose, maintain and repair ice making systems.
53.0 Use refrigeration electrical system skills in commercial applications.
54.0 Maintain and troubleshoot commercial refrigeration systems.

Florida Department of Education
Student Performance Standards

Program Title: Heating, Ventilation, Air-Conditioning/Refrigeration (HVAC/R)
Career Certificate Program Number: C400400

Course Number: ACR0000 **Occupational Completion Point: A** **Introduction to HVAC/R – 250 Hours**	
01.0	Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
01.01	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.02	Explain the reasons for regular safety meetings and for company safety policies.
01.03	Explain the need for employee-background checks and medical examinations.
01.04	Identify appropriate fire extinguishers and other such safety devices.
01.05	Identify and follow emergency and rescue procedures.
01.06	Identify and use safe-handling practices as they relate to hazardous and volatile fluids, compounds and gases.
01.07	Demonstrate Occupational Safety and Health Administration (OSHA) 10, Environmental Protection Agency (EPA) practices, Department of Transportation (DOT) hazardous materials safety requirements, lock-out and tag out, and electrical safety.
01.08	Obtain EPA 608 HVAC Technician, OSHA 10 or OSHA 30 Construction Industry training and, optionally, the associated certification.
01.09	Select and wear proper protective clothing and equipment.
01.10	Describe the purpose and requirements of local, state and federal heating, air-conditioning and refrigeration codes and standards as well as the manufacturer's installation instructions.
01.11	Identify and use OSHA practices when working with heating, air-conditioning and refrigeration systems and equipment.
01.12	Explain emergency procedures to follow in response to workplace accidents.
01.13	Understand a disaster and/or emergency response plan.
02.0	Explain the importance of employability, soft skills, entrepreneurship skills and making career plans. The student will be able to:
02.01	Identify and demonstrate positive work behaviors, including soft skills and entrepreneurship skills, needed to be employable.
02.02	Develop personal career plan that includes goals, objectives and strategies.

	02.03 Create and maintain a career portfolio to document knowledge, skills and experience. (Optional)
	02.04 Exhibit a professional appearance through appropriate grooming and attire.
	02.05 Evaluate and compare employment opportunities that match career goals.
	02.06 Identify and exhibit traits for retaining employment.
	02.07 Identify opportunities and research requirements for career advancement.
	02.08 Research the benefits of ongoing professional development.
	02.09 Examine licensing, certification and industry credentialing requirements.
03.0	Identify, use and maintain the tools and tool accessories used in the heating, air-conditioning and refrigeration industry. The student will be able to:
	03.01 Follow safety precautions when using hand and power tools.
	03.02 Identify and use basic hand tools and tool accessories; power tools (electric and mechanical); pipe and tube-working tools; and specialized tools of the trade.
	03.03 Apply appropriate care and maintenance procedures for tools and tool accessories, following the directions in the tool-equipment manufacturer's manual.
	03.04 Include manufacturer’s representative and tool distributors for participation in class instruction. (Optional)
04.0	Demonstrate mathematics knowledge and skills. The student will be able to:
	04.01 Demonstrate knowledge of arithmetic operations.
	04.02 Analyze and apply data and measurements to solve problems and interpret documents.
05.0	Explain the properties of matter and heat behavior. The student will be able to:
	05.01 Describe and explain freezing point, critical temperature and absolute zero.
	05.02 Explain the gas laws (Dalton, Boyle and Charles) used when dealing with air and its properties.
	05.03 Describe matter, heat and heat transfer.
	05.04 Differentiate between heat and temperature.
	05.05 Explain and distinguish among the characteristics of the three states of matter.
	05.06 Explain the relationship between temperature and humidity.

	05.07 Differentiate between latent heat and sensible heat.
06.0	Describe the history and concepts of heating, air-conditioning and refrigeration. The student will be able to:
	06.01 Explain the basic principles of heating, ventilation and air-conditioning.
	06.02 Identify the refrigeration cycle.
	06.03 Identify and explain the four major refrigeration components.
	06.04 Identify and explain the characteristics of a compression-cycle refrigerant system.
	06.05 Differentiate between air-conditioning and refrigeration.
	06.06 Differentiate between split systems, mini-splits and package systems.
07.0	Analyze fluids, pressures, refrigerants and related codes. The student will be able to:
	07.01 Identify and explain general safety issues and EPA rules and regulations regarding the handling of refrigerants.
	07.02 Define and explain pressure, fluid and temperature.
	07.03 Explain the standards for and ways to measure and calculate absolute and gauge pressures.
	07.04 Identify and explain the classifications, properties and uses of different refrigerants based on chemical composition.
	07.05 Explain how fluids react and flow in a closed versus an open environment or vessel.
	07.06 Define and identify "color-coding" of refrigerant cylinders.
	07.07 Explain the proper methods of transferring, storing and recovering refrigerants.
	07.08 Explain the effects of an improper refrigerant and contaminants in a system.
	07.09 Identify the refrigerants in common use and state the types of applications in which each is used.
	07.10 Describe how azeotropes and near-azeotropes differ from each other and from so-called pure refrigerants.
	07.11 Compare and interpret a P-T chart for pure refrigerants, azeotrope, and near-azeotrope refrigerants and explain the difference between bubble point and dew point.
	07.12 Demonstrate refrigerant leak detecting methods.
	07.13 Identify the different types of oils used in refrigeration systems and explain their relationships to the various refrigerants.
	07.14 Explain how to add and remove oil from a system.

	07.15 Describe how to test oil for acid contamination.
08.0	Evaluate heating, air-conditioning and refrigeration system components and accessories. The student will be able to:
	08.01 Explain the types, operation, use and requirements of:
	• Compressors (such as reciprocating, rotary, screw, scroll and inverter)
	• Condensers and evaporators (such as evaporative condensers, evaporative coils, shell and tube, tube within a tube and fin and tube)
	• Metering devices (such as adjusting automatic and thermostatic expansion valves, fixed orifices, stepper motor electronic expansion valve (EEV), solenoid EEV and other devices available on the local market)
	08.02 Identify the location and explain the uses of refrigerant flow accessories.
	08.03 Identify the location and explain the uses of heating, air-conditioning and refrigeration-system accessories (such as receivers, dryers/filers, solenoid valves, heat exchangers, accumulators, suction filter, oil separators, evaporator pressure-regulating valve, crankcase pressure-regulating valves, hot gas bypass valves and check valves).
09.0	Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry. The student will be able to:
	09.01 Identify and explain the purpose of the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
	09.02 Bend tubing, using tube benders.
	09.03 Connect tubing using flared fittings, pressed fittings and compression fittings.
	09.04 Connect tubing, using a swaged-joint connection.
	09.05 Identify and use various types of torches.
	09.06 Identify, select and use appropriate brazing alloys, materials and skills.
	09.07 Explain the purposes and procedures for protecting piping materials and fabrication, such as valves, fittings and products from heat.
	09.08 Braze tubing while purging dry nitrogen.
	09.09 Silver-braze brass, steels and copper.
	09.10 Demonstrate an understanding of the procedures for installing pipe and tubing insulation.
	09.11 Explain the procedures required for installing heating, air-conditioning, refrigerant and ventilation accessories.
	09.12 Fabricate and leak-test the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.

	09.13 Demonstrate proper safety measures when fabricating and servicing piping, tubing and fittings.
10.0	Utilize and operate mechanical refrigeration servicing and testing equipment. The student will be able to:
	10.01 Identify the effects of superheat and sub-cooling on a system.
	10.02 Identify and explain the functions of servicing and testing equipment (such as vacuum pumps, micron gauges, EPA-approved equipment, leak detectors and charging systems).
	10.03 Operate a refrigerant recovery system.
	10.04 Apply specific safety and recovery practices for refrigerants used in the industry.
	10.05 Apply specific safety practices as they relate to handling and storing cylinders and materials.
	10.06 Explain the standards for and ways to measure, test, maintain and evacuate a mechanical heating, air-conditioning and refrigeration system.
	10.07 Evacuate the refrigerant system with various vacuum methods.
	10.08 Demonstrate compliance with Environmental Protection Agency (EPA) rules and regulations and, if possible, take the EPA test.
	10.09 Charge various air-conditioning and mechanical refrigeration systems by various methods.
	10.10 Demonstrate the effects of superheat and sub-cooling on a system utilizing test equipment (such as thermometers and gages).

Course Number: ACR0001 Occupational Completion Point: B HVAC/R Fundamentals – 250 Hours	
11.0	Demonstrate a practical knowledge of basic electricity and of the electrical components of heating, air-conditioning and refrigeration equipment. The student will be able to:
	11.01 Explain the principles of electricity.
	11.02 Explain single- and three-phase power distribution.
	11.03 Define and explain watts, ohms, volts and amps.
	11.04 Identify and explain electrical measuring tools and devices.
	11.05 Explain the standards for and ways to measure watts, resistance, voltage and amperage, using appropriate instruments or devices.
12.0	Demonstrate knowledge of electrical wiring in air-conditioning and refrigeration. The student will be able to:
	12.01 Identify and explain appropriate electrical wiring symbols.

	12.02 Draw and explain a wiring schematic diagram for a control system.
	12.03 Create a wiring schematic for an air conditioner an electric furnace, a heat pump, an oil furnace (optional) and a gas furnace.
13.0	Troubleshoot heating, air-conditioning and refrigeration electrical control systems and their components. The student will be able to:
	13.01 Identify and explain the operations of electrical control systems and their components (zone damper motors, duel fuel lock out controls, outdoor thermostats/low ambient controls, defrost controls/timers and auxiliary heating controls, contactors, relays, circuit boards, motors, solenoids, and thermostats.).
	13.02 Troubleshoot protection devices, such as fuses and breakers.
	13.03 Identify, install and troubleshoot controls for heating, air-conditioning and refrigeration systems.
	13.04 Explain the operation of different types of electromechanical communicating, humidity control, and Wi-Fi and programmable operating thermostats.
	13.05 Understand the basics of how to troubleshoot operational problems for different types of electromechanical communicating, humidity control, and Wi-Fi operating thermostats.
	13.06 Understand, install and troubleshoot invertor technology.
14.0	Select and test electrical generation and distribution components for commercial heating and air conditioning systems. The student will be able to:
	14.01 Determine wire sizes and voltage drops.
	14.02 Describe the operation of various types of transformers, including 230 vs. 208 volt issues and also voltage issues from compressor time delays.
15.0	Maintain, test and troubleshoot electrical motors and their components for commercial heating and air-conditioning systems. The student will be able to:
	15.01 Explain how alternating current is developed and draw a sine wave.
	15.02 Identify and explain single-phase and three-phase wiring arrangements.
	15.03 Explain how phase shift occurs in inductors and capacitors.
	15.04 Describe the types of capacitors and their applications.
	15.05 Explain the operation of single-phase and three-phase induction motors.
	15.06 Identify and explain the operations and applications of various types of electrical motors, including electronically commutated motors (ECM) and variable speed motors, and their components as used in heating and air-conditioning systems.
	15.07 Maintain, test and troubleshoot various types of electrical motors, including ECM and variable speed motors and their components as used in heating and air-conditioning systems.
	15.08 Demonstrate the proper use of motor testing equipment.

	15.09 Demonstrate how to reverse the rotation of a motor.

Course Number: ACR0012 Occupational Completion Point: C HVAC/R Service Practices – 250 Hours	
16.0	Utilize mechanical components of heating air-conditioning and refrigeration systems. The student will be able to:
	16.01 Evaluate metering-device performance.
	16.02 Explain the methods of compression, lubrication and compressor modulation.
	16.03 Analyze the operating condition of a compressor.
	16.04 Test, troubleshoot and correct the causes of mechanical problems in a heating, air-conditioning and refrigeration system.
	16.05 Evaluate system performance.
17.0	Operate solid-state electronics as used in heating, air-conditioning and refrigeration systems. The student will be able to:
	17.01 Explain the basic principles and functions of Direct Digital Control (DDC).
	17.02 Explain basic solid-state circuits and boards.
	17.03 Identify, test and replace circuits and boards.
	17.04 Explain codes and standards and safety requirements for working with the electrical components used in heating, air conditioning and refrigeration.
18.0	Read construction documents. The student will be able to:
	18.01 Recognize and identify basic construction drawing terms, components and symbols.
	18.02 Relate information on construction drawings to actual locations on the project.
	18.03 Recognize different classifications of construction drawings.
	18.04 Interpret and use drawing dimensions.
19.0	Assist in the installation of a residential heating and air-conditioning system and determine start-up procedures. The student will be able to:
	19.01 Read and comply with dispatch orders.
	19.02 Explain codes and ordinances.

	19.03 Assist in the installation of a heating and air-conditioning system to the manufacturer's installation and operation specifications, using a practical knowledge of duct fabrication methods.
	19.04 Determine which charging method is appropriate for a given type of system in a residential air-conditioning unit and adjust superheat and/or sub-cooling.
	19.05 Determine the temperature split/ difference across the evaporator.
	19.06 Determine the temperature split/ difference across the condenser.
	19.07 Explain the electrical and mechanical operations of the basic heat pump.
	19.08 Write a service report.
	19.09 Apply good customer-relations skills.
20.0	Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems. The student will be able to:
	20.01 Identify and explain the following heat-pump systems: air-to-air, water-to-air, water-to-water, air-to-ground (geothermal), open-loop and closed-loop.
	20.02 Determine the start-up and checkout procedures recommended by different manufacturers.
	20.03 Determine the temperature split/difference across the ***outdoor*** coil on a heat pump.
	20.04 Determine the temperature split/difference across the ***indoor*** coil on a heat pump.
	20.05 Apply good customer-relations skills.
21.0	Use combustion-type heating servicing and testing equipment--The student will be able to:
	21.01 Explain combustion theory and the safety precautions for using combustion-type-heating servicing and testing equipment.
	21.02 Identify and explain the various types of combustion-type heating servicing and testing equipment (such as draft gauge, U-tube manometer, sling psychrometer, millivolt meter and oil-furnace testing equipment).
	21.03 Use the servicing and testing equipment.
	21.04 Test, analyze and troubleshoot combustion-type-heating systems.
22.0	Troubleshoot combustion gas valves and regulators as used in heating, air-conditioning, refrigeration and ventilation systems. The student will be able to:
	22.01 Identify and discuss the safety and regulation issues and concerns.
	22.02 Explain the operations of various types of gas valves and regulators, such as low-voltage, line-voltage, pneumatic (optional), solenoid, gas and pressure regulators, etc.
	22.03 Identify various types of gas valves and regulators.

	22.04 Determine the application of gas valves and regulators.
	22.05 Troubleshoot gas valves and regulators.
23.0	Understand the design of heating and cooling systems. The student will be able to:
	23.01 Identify and describe the steps in the system design process.
	23.02 Use construction drawings or an actual job site to obtain information needed to complete heating and cooling load estimates.
	23.03 Identify the factors that affect heat gains and losses to a building and describe how these factors influence the design process.
	23.04 Complete a load estimate to determine the heating and/or cooling load of a building.
	23.05 State the principles that affect the selection of equipment to satisfy the calculated heating and/or cooling load.
	23.06 Select heating and/or cooling equipment using manufacturers' product data.
	23.07 Identify the various types of duct systems and explain why and where each type is used.
	23.08 Demonstrate the effect of fittings and transitions on duct system design.
	23.09 Use a friction loss chart and duct sizing table to size duct.
	23.10 Install insulation and vapor barriers used in duct systems.
	23.11 Select and install refrigerant and condensate piping following proper design principles.
	23.12 Describe airflow and pressures in a basic forced-air distribution system.
	23.13 Explain the differences between propeller and centrifugal fans and blowers.
	23.14 Identify the various types of duct systems and explain why and where each type is used.
	23.15 Demonstrate or explain the installation of metal, fiberboard and flexible duct.
	23.16 Demonstrate or explain the installation of fittings and transitions used in duct systems.
	23.17 Identify and explain the operations of electrical control systems and their components (zone damper motors).
	23.18 Demonstrate or explain the use and installation of dampers used in duct systems.
	23.19 Demonstrate or explain the use and installation of insulation and vapor barriers used in duct systems.
	23.20 Identify instruments used to make measurements in air systems and explain the use of each instrument.

	23.21 Make basic temperature, air pressure and velocity measurements in an air distribution system.
	23.22 Describe the benefits of conditioned air and indoor air quality.
	23.23 Identify various professional organizations, associations and societies and explain their purposes.
24.0	(Optional) Explain the importance of employability, soft skills, entrepreneurship skills and making career plans. The student will be able to:
	24.01 Identify and demonstrate positive work behaviors, including soft skills and entrepreneurship skills, needed to be employable.
	24.02 Develop personal career plan that includes goals, objectives and strategies.
	24.03 Create and maintain a career portfolio to document knowledge, skills and experience.
	24.04 Exhibit a professional appearance through appropriate grooming and attire.
	24.05 Evaluate and compare employment opportunities that match career goals.
	24.06 Identify and exhibit traits for retaining employment.
	24.07 Identify opportunities and research requirements for career advancement.
	24.08 Research the benefits of ongoing professional development.
	24.09 Examine licensing, certification and industry credentialing requirements.

Course Number: ACR0013 **Occupational Completion Point: D** **HVAC/R Intermediate Service Practices – 250 Hours**	
25.0	Select appropriate commercial compressors. The student will be able to:
	25.01 Compare commercial-compressor requirements with those for residential and light commercial heating and air-conditioning systems.
	25.02 Discuss appropriate commercial compressors for cooling requirements.
	25.03 Describe the mechanical operation for each type of compressor.
	25.04 Explain compressor lubrication methods.
	25.05 Explain methods used to control compressor capacity.
	25.06 Describe how compressor protection devices operate.

	25.07 Perform the common procedures used when field servicing open and semi-hermetic compressors.
26.0	Test and adjust commercial evaporative condensers. The student will be able to:
	26.01 Determine the proper air and fluid flow for commercial evaporative condensers.
	26.02 Test and adjust the airflow for proper temperature difference.
	26.03 Test and adjust the water flow for proper GPM and temperature difference.
	26.04 Check for proper water treatment.
27.0	Maintain, test and troubleshoot commercial evaporators. The student will be able to:
	27.01 Determine the operational requirements for evaporators used in commercial heating and air-conditioning applications.
	27.02 Discuss appropriate evaporators for commercial heating and air-conditioning systems
	27.03 Maintain, test and adjust commercial heating and air-conditioning accessories.
	27.04 Select the heating and air-conditioning accessories appropriate for various commercial applications.
28.0	Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing. The student will be able to:
	28.01 Identify and explain various types of heating, air-conditioning and refrigeration piping.
	28.02 Identify basic principles of sizing various heating, air conditioning, refrigeration and ventilation for various tasks.
	28.03 Explain pressure and temperature drops.
29.0	Maintain, troubleshoot and repair commercial heating systems. The student will be able to:
	29.01 Identify the components of various commercial heating systems.
	29.02 Explain the operational principles of various commercial heating systems.
	29.03 Test and analyze heating air-distribution systems.
	29.04 Maintain, troubleshoot and repair various commercial heating systems.
30.0	Discuss new HVAC/R technologies. The student will be able to:
	30.01 Follow all HVAC/R related safety precautions.
	30.02 Describe new technologies in HVAC/R installation, including variable-speed motors, heat-pipe systems, desiccant systems, gas-driven heating systems, etc.

	30.03 Describe multi-ports and Variable Refrigerant Volume (VRV)/Variable Refrigerant Flow (VRF) systems.
	30.04 Explain how to lay out, construct and troubleshoot comfort systems.
	30.05 Test and analyze systems.
	30.06 Test and analyze heat-recovery systems and VRV/VRF.
31.0	Interpret, use and modify construction drawings and specifications. The student will be able to:
	31.01 Read mechanical plans within a set of construction drawings explain their relationship.
	31.02 Compare mechanical plans with the actual installation of duct and pipe runs, fittings and sections.
	31.03 Interpret specification documents and apply them to the plans.
	31.04 Interpret shop drawings and apply them to the plans and specifications. (Optional)
	31.05 Develop a field set of as-built drawings. (Optional)
	31.06 Identify the steps required for transferring design information to component production. (Optional)
	31.07 List and classify materials most commonly used in HVAC systems.
32.0	Troubleshoot and repair commercial heating and air-conditioning systems. The student will be able to:
	32.01 Keep a record of the installation, maintenance and repair of commercial heating and air-conditioning systems.
	32.02 Apply local, national and international codes and safety practices.
	32.03 Lay out a commercial heating and air-conditioning system.
	32.04 Lay out a typical split commercial air-conditioning system.
	32.05 Lay out a typical split commercial heating system.
	32.06 Maintain, test, analyze and repair various types of commercial heating and air-conditioning systems.
	32.07 Maintain, troubleshoot and repair water-cooled condensers.

NOTE: Students may choose one of the following courses for the completion of OCP E: ACR0044 or ACR0045

Course Number: ACR0044 Occupational Completion Point: E – Option 1 HVAC/R Advanced Service Practices – 350 Hours	
33.0	Develop an understanding of hydronic systems. The student will be able to:
33.01	Explain the terms and concepts used when working with hot-water heating systems.
33.02	Identify the major components of hot-water heating systems.
33.03	Explain the purpose of each component of hot-water heating systems.
33.04	Describe the safety precautions used when working with hot water systems.
33.05	Identify the common piping configurations used with hot water heating systems.
33.06	Explain the principles involved and describe the procedures used in balancing hydronic systems.
33.07	Select, calibrate and properly use the tools and instruments needed to balance hydronic systems.
33.08	Read the pressure across a water system circulating pump.
34.0	Determine the properties of air. The student will be able to:
34.01	Explain the principles of psychrometrics.
34.02	Identify and explain the components and uses of a psychrometric meter.
34.03	Identify indoor air quality concerns as related to psychrometrics, including mold detection, prevention and remediation.
34.04	Determine the properties of air, using a psychrometric chart.
34.05	Follow safety precautions.
34.06	Identify and explain the different types and benefits of air filtration systems, products for improving indoor air quality.
34.07	Fabricate, operate, maintain and troubleshoot air filtration systems, air handling systems and ventilation systems.
35.0	Use a pressure enthalpy chart to diagram refrigerant cycles. The student will be able to:
35.01	Identify all components of the pressure enthalpy chart.
35.02	Define enthalpy and entropy.
36.0	Explain the standards for and ways to measure indoor air quality. The student will be able to:

	36.01 Identify and explain the codes and standards regarding indoor air quality.
	36.02 Select and use indoor air quality measuring devices.
	36.03 Explain the standards for and ways to measure indoor air quality using various methods.
37.0	(Optional) Identify and understand pneumatic control systems for commercial heating and air-conditioning applications. The student will be able to:
	37.01 Identify pneumatic control systems and explain the transition to electro/pneumatic systems.
	37.02 Understand the functions of direct acting and reverse acting controls of pneumatic control systems.
38.0	Develop an understanding of chilled systems. The student will be able to:
	38.01 Explain the terms and concepts used when working with chilled-water cooling systems.
	38.02 Identify the major components of chilled-water cooling and dual-temperature water systems.
	38.03 Explain the purpose of each component of chilled-water cooling and dual-temperature water systems.
	38.04 Describe the safety precautions used when working with chilled-water systems.
	38.05 Explain the differences between reciprocating, rotary screw, scroll and centrifugal chillers.
39.0	(Optional) Maintain and repair thermal storage systems. The student will be able to:
	39.01 Apply appropriate codes, standards and safety practices.
	39.02 Describe the benefits and limitations of each type.
	39.03 Explain the operational principles of a thermal storage system.
	39.04 Identify and explain various types of thermal storage systems.
	39.05 Troubleshoot and test various types of thermal storage systems.
40.0	Understand and explain the calculation of commercial heating and air-conditioning loads. The student will be able to:
	40.01 Explain conduction as a heat-load source.
	40.02 Describe the implications of conducting and the resistance values for different types of construction materials.
	40.03 Interpret heat-transfer tables and define values U, K, C and R.
	40.04 Locate the total heat-transfer value of any surface.

	40.05 Explain infiltration and exfiltration/ventilation as a heat-load source.
	40.06 Explain a product heat-load source.
	40.07 Explain miscellaneous loads (people, motors and equipment) as heat-load sources.
	40.08 Explain the purpose of vapor barriers.
	40.09 Interpret tables of specific heat values as applied to commercial heating and air-conditioning systems.
	40.10 Understand the importance of system design and load calculation process of heating and cooling systems.
	40.11 Understand and explain the methods of installing air-movement systems.
41.0	Balance an air distribution system. The student will be able to:
	41.01 Explain the fan and pump laws.
	41.02 Use a psychrometric chart to evaluate air properties and changes in air properties.
	41.03 Explain the principles involved in the balancing of air and water distribution systems.
	41.04 Define common terms used by manufacturers when describing grilles, registers and diffusers.
	41.05 Identify and use the tools and instruments needed to balance air distribution systems.
	41.06 Change the speed of an air distribution system supply fan.
42.0	Select energy conservation equipment. The student will be able to:
	42.01 Identify and explain the operation of energy conservation equipment.
	42.02 Operate selected energy conservation equipment.
43.0	Analyze building management systems. The student will be able to:
	43.01 Identify the major components of a building management system and describe how they fit together.
	43.02 Explain a basic direct digital controller.
44.0	(Optional) Recommend alternative heating and cooling systems for various case studies. The student will be able to:
	44.01 Describe alternative technologies for heating such as in-floor, direct-fired makeup unit (DFMU), solar, air turnover, corn or wood pellet burners, waste oil/multi-fuel and fireplace inserts.
	44.02 Describe alternative technologies for heating and cooling such as ductless systems, computer rooms, chilled beams and multi-zone.

NOTE: Students may choose one of the following courses for the completion of OCP E: ACR0044 or ACR0045

Course Number: ACR0045 Occupational Completion Point: E – Option 2 HVAC/R Advanced Commercial and Industrial Service Practices – 350 Hours	
45.0	Demonstrate knowledge of retail refrigeration systems. The student will be able to:
45.01	Describe the mechanical refrigeration cycle as it applies to retail refrigeration systems.
45.02	Explain the differences in refrigerants and applications in low-, medium-, high-temperature, flammable and toxic refrigeration systems.
45.03	Identify and describe the primary refrigeration cycle components used in retail refrigeration systems.
45.04	Identify and describe the supporting components and accessories used in retail refrigeration systems.
45.05	Describe the various methods of defrost used in retail refrigeration systems.
45.06	Identify and describe the applications for the various types of retail refrigeration systems.
45.07	Describe the control system components used in retail refrigeration systems.
45.08	Explain the operating sequence of a retail refrigeration system.
45.09	Interpret wiring diagrams and troubleshooting charts to isolate malfunctions in retail refrigeration systems.
46.0	Demonstrate knowledge of commercial and industrial refrigeration systems. The student will be able to:
46.01	Identify different types of refrigerated coolers and display cases and describe each one’s common application.
46.02	Compare the basic components used in commercial/industrial refrigeration systems with those used in retail refrigeration systems.
46.03	Identify single, multiple and satellite compressor systems; describe the applications, installation considerations and advantages and disadvantages of each type.
46.04	Identify packaged condensing units and unit coolers; describe their applications, operation and installation considerations.
46.05	Identify two-stage and inverter compressors and explain their operation and applications.
46.06	Identify the various accessories used in commercial refrigeration systems and explain why each is used and where it should be installed in the system.
46.07	Identify the various refrigeration control devices and explain the purpose of each type and how it works.
47.0	Demonstrate a working knowledge of electrical generation and distribution components for commercial heating and air conditioning systems. The student will be able to:

	47.01 Calculate loads and design and lay out a commercial refrigeration system.
	47.02 Identify and explain commercial refrigeration-pressure-regulation devices, controls and components.
	47.03 Test and troubleshoot refrigerant-pressure-regulating devices, controls and components.
	47.04 Apply local and national codes and mechanical safety practices.
48.0	Demonstrate a working knowledge of refrigeration system vibration and insulation. The student will be able to:
	48.01 Describe the applications of vibration eliminators.
	48.02 Identify and select the correct insulation for commercial application.
49.0	Apply commercial refrigeration pipe sizing and troubleshooting procedures. The student will be able to:
	49.01 Determine the capacities of refrigerant lines, including the amounts they will hold, equivalent lengths of fittings and the total effective length for various pipelines.
	49.02 Identify and apply industry approved installation procedures.
	49.03 Troubleshoot refrigeration pipe sizing problems.
	• Explain the use of traps in suction line risers.
	• Explain pressure drop.
	• Calculate pressure drop in liquid line risers.
	• Size double risers, hot gas lines and liquid lines from condenser to receiver.
50.0	Use refrigeration systems skills in commercial applications. The student will be able to:
	50.01 Identify and apply the safety practices used with commercial refrigeration systems.
	50.02 Apply refrigeration-systems skills to commercial refrigeration systems.
	• Perform dehydration, evacuation and recovery procedures.
	• Interpret blueprints and mechanical drawings.
	• Service and charge a refrigeration system.
	• Test, analyze and replace compressors.
	• Retrofit alternative refrigerants and oils.

51.0	Demonstrate a working knowledge of refrigerated storage systems. The student will be able to:
	51.01 Identify and differentiate among various types of cases, such as service cases and self-service cases.
	51.02 Explain the operation of air screen freezers, glass door freezers, coffin cases and walk in coolers.
	51.03 Differentiate among medium-temperature, low-temperature and ultralow-temperature systems.
	51.04 Explain various defrost methods.
	51.05 Maintain, test and troubleshoot defrost components.
	51.06 Identify and explain the components of various refrigerated storage systems.
	51.07 Maintain, test and troubleshoot various refrigerated storage system components.
52.0	Diagnose, maintain and repair ice making systems. The student will be able to:
	52.01 Identify and explain various types and operations of ice making systems.
	52.02 Maintain, test, troubleshoot and repair various types of ice making systems, following the manufacturers' recommendations.
	52.03 Identify and explain the different types of water treatment methods and systems.
	52.04 Analyze water to identify water problems and the proper treatments.
	52.05 Install, service and repair ice machines and specialty refrigeration systems.
53.0	Use refrigeration electrical system skills in commercial applications. The student will be able to:
	53.01 Apply electrical safety practices for commercial refrigeration systems.
	53.02 Apply refrigeration electrical system skills to commercial refrigeration systems:
	• Interpret symbols of electrical components and diagrams.
	• Interpret schematics and diagrams.
	• Apply electrical theory and calculations.
	• Explain the principles of designing electrical systems.
	• Test and troubleshoot single-, three-phase, ECM, and variable speed motors.
	53.03 Test the solid state components used in commercial refrigeration systems.

	53.04 Troubleshoot and diagnose the electrical circuits used in commercial refrigeration systems.
	53.05 Test and troubleshoot the thermostatic controls used in commercial refrigeration systems.
54.0	Maintain and troubleshoot commercial refrigeration systems. The student will be able to:
	54.01 Follow appropriate safety precautions for commercial refrigeration systems.
	54.02 Identify and explain the operations of various types of commercial refrigeration systems and applications, such as single, multiplex and cascade systems.
	54.03 Maintain and troubleshoot various types of commercial refrigeration systems.

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Heating, Ventilation, Air-Conditioning/Refrigeration (HVAC/R) 1**
Program Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

Career Certificate Program		
Program Number	C400410	
CIP Number	0615050111	
Grade Level	30, 31	
Program Length	750 Hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 10	Communications (Reading and Language Arts): 9

Purpose

The purpose of this program is to prepare students for employment or advanced training in the heating, ventilation, air-conditioning/refrigeration (HVAC/R) industry. The student should obtain EPA certification prior to leaving school in order to be employed in any job that requires work with refrigerants. This program focuses on broad, transferable skills, stresses the understanding of the heating, air-conditioning, refrigeration and ventilation industry and demonstrates elements of the industry such as planning, management, finance, technical and production skills, the underlying principles of technology, and health, safety and environmental issues.

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 designing, testing and repairing heating, ventilation, air-conditioning and cooling (HVAC) systems.

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

Program Structure

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

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

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	ACR0000	Introduction to HVAC/R	AC HEAT ME @7 G REFRG MECH 7 G	250 Hours
B	ACR0001	HVAC/R Fundamentals		250 Hours
C	ACR0012	HVAC/R Service Practices		250 Hours

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
02.0 Explain the importance of employability, soft skills, entrepreneurship skills and making career plans.
03.0 Identify, use and maintain the tools and tool accessories used in the heating, air-conditioning and refrigeration industry.
04.0 Demonstrate mathematics knowledge and skills.
05.0 Explain the properties of matter and heat behavior.
06.0 Describe the history and concepts of heating, air-conditioning and refrigeration.
07.0 Analyze fluids, pressures, refrigerants and related codes.
08.0 Evaluate heating, air-conditioning and refrigeration system components and accessories.
09.0 Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning & refrigeration industry.
10.0 Utilize and operate mechanical refrigeration servicing and testing equipment.
11.0 Demonstrate a practical knowledge of basic electricity and of the electrical components of heating, air-conditioning and refrigeration equipment.
12.0 Demonstrate knowledge of electrical wiring in air-conditioning and refrigeration.
13.0 Troubleshoot heating, air-conditioning and refrigeration electrical control systems and their components.
14.0 Select and test electrical generation and distribution components for commercial heating and air conditioning systems.
15.0 Maintain, test and troubleshoot electrical motors and their components for commercial heating and air-conditioning systems.
16.0 Utilize mechanical components of heating air-conditioning and refrigeration systems.
17.0 Operate solid-state electronics as used in heating, air-conditioning and refrigeration systems.
18.0 Read construction documents.
19.0 Assist in the installation of a residential heating and air-conditioning system and determine start-up procedures.
20.0 Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems.
21.0 Use combustion-type heating servicing and testing equipment.
22.0 Troubleshoot combustion gas valves and regulators as used in heating, air-conditioning, refrigeration and ventilation systems.
23.0 Understand the design of heating and cooling systems.
24.0 (Optional) Explain the importance of employability, soft skills, entrepreneurship skills and making career plans.

Florida Department of Education
Student Performance Standards

Program Title: Heating, Ventilation, Air-Conditioning/Refrigeration (HVAC/R) 1
Career Certificate Program Number: C400410

Course Number: ACR0000 **Occupational Completion Point: A** **Introduction to HVAC/R – 250 Hours**	
01.0	Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
01.01	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.02	Explain the reasons for regular safety meetings and for company safety policies.
01.03	Explain the need for employee-background checks and medical examinations.
01.04	Identify appropriate fire extinguishers and other such safety devices.
01.05	Identify and follow emergency and rescue procedures.
01.06	Identify and use safe-handling practices as they relate to hazardous and volatile fluids, compounds and gases.
01.07	Demonstrate Occupational Safety and Health Administration (OSHA) 10, Environmental Protection Agency (EPA) practices, Department of Transportation (DOT) hazardous materials safety requirements, lock-out and tag out, and electrical safety.
01.08	Obtain EPA 608 HVAC Technician, OSHA 10 or OSHA 30 Construction Industry training and, optionally, the associated certification.
01.09	Select and wear proper protective clothing and equipment.
01.10	Describe the purpose and requirements of local, state and federal heating, air-conditioning and refrigeration codes and standards as well as the manufacturer's installation instructions.
01.11	Identify and use OSHA practices when working with heating, air-conditioning and refrigeration systems and equipment.
01.12	Explain emergency procedures to follow in response to workplace accidents.
01.13	Understand a disaster and/or emergency response plan.
02.0	Explain the importance of employability, soft skills, entrepreneurship skills and making career plans. The student will be able to:
02.01	Identify and demonstrate positive work behaviors, including soft skills and entrepreneurship skills, needed to be employable.
02.02	Develop personal career plan that includes goals, objectives and strategies.

	02.03 Create and maintain a career portfolio to document knowledge, skills and experience. (Optional)
	02.04 Exhibit a professional appearance through appropriate grooming and attire.
	02.05 Evaluate and compare employment opportunities that match career goals.
	02.06 Identify and exhibit traits for retaining employment.
	02.07 Identify opportunities and research requirements for career advancement.
	02.08 Research the benefits of ongoing professional development.
	02.09 Examine licensing, certification and industry credentialing requirements.
03.0	Identify, use and maintain the tools and tool accessories used in the heating, air-conditioning and refrigeration industry. The student will be able to:
	03.01 Follow safety precautions when using hand and power tools.
	03.02 Identify and use basic hand tools and tool accessories; power tools (electric and mechanical); pipe and tube-working tools; and specialized tools of the trade.
	03.03 Apply appropriate care and maintenance procedures for tools and tool accessories, following the directions in the tool-equipment manufacturer's manual.
	03.04 Include manufacturer’s representative and tool distributors for participation in class instruction. (Optional)
04.0	Demonstrate mathematics knowledge and skills. The student will be able to:
	04.01 Demonstrate knowledge of arithmetic operations.
	04.02 Analyze and apply data and measurements to solve problems and interpret documents.
05.0	Explain the properties of matter and heat behavior. The student will be able to:
	05.01 Describe and explain freezing point, critical temperature and absolute zero.
	05.02 Explain the gas laws (Dalton, Boyle and Charles) used when dealing with air and its properties.
	05.03 Describe matter, heat and heat transfer.
	05.04 Differentiate between heat and temperature.
	05.05 Explain and distinguish among the characteristics of the three states of matter.
	05.06 Explain the relationship between temperature and humidity.

	05.07 Differentiate between latent heat and sensible heat.
06.0	Describe the history and concepts of heating, air-conditioning and refrigeration. The student will be able to:
	06.01 Explain the basic principles of heating, ventilation and air-conditioning.
	06.02 Identify the refrigeration cycle.
	06.03 Identify and explain the four major refrigeration components.
	06.04 Identify and explain the characteristics of a compression-cycle refrigerant system.
	06.05 Differentiate between air-conditioning and refrigeration.
	06.06 Differentiate between split systems, mini-splits and package systems.
07.0	Analyze fluids, pressures, refrigerants and related codes. The student will be able to:
	07.01 Identify and explain general safety issues and EPA rules and regulations regarding the handling of refrigerants.
	07.02 Define and explain pressure, fluid and temperature.
	07.03 Explain the standards for and ways to measure and calculate absolute and gauge pressures.
	07.04 Identify and explain the classifications, properties and uses of different refrigerants based on chemical composition.
	07.05 Explain how fluids react and flow in a closed versus an open environment or vessel.
	07.06 Define and identify "color-coding" of refrigerant cylinders.
	07.07 Explain the proper methods of transferring, storing and recovering refrigerants.
	07.08 Explain the effects of an improper refrigerant and contaminants in a system.
	07.09 Identify the refrigerants in common use and state the types of applications in which each is used.
	07.10 Describe how azeotropes and near-azeotropes differ from each other and from so-called pure refrigerants.
	07.11 Compare and interpret a P-T chart for pure refrigerants, azeotrope, and near-azeotrope refrigerants and explain the difference between bubble point and dew point.
	07.12 Demonstrate refrigerant leak detecting methods.
	07.13 Identify the different types of oils used in refrigeration systems and explain their relationships to the various refrigerants.
	07.14 Explain how to add and remove oil from a system.

	07.15 Describe how to test oil for acid contamination.
08.0	Evaluate heating, air-conditioning and refrigeration system components and accessories. The student will be able to:
	08.01 Explain the types, operation, use and requirements of:
	• Compressors (such as reciprocating, rotary, screw, scroll and inverter)
	• Condensers and evaporators (such as evaporative condensers, evaporative coils, shell and tube, tube within a tube and fin and tube)
	• Metering devices (such as adjusting automatic and thermostatic expansion valves, fixed orifices, stepper motor electronic expansion valve (EEV), solenoid EEV and other devices available on the local market)
	08.02 Identify the location and explain the uses of refrigerant flow accessories.
	08.03 Identify the location and explain the uses of heating, air-conditioning and refrigeration-system accessories (such as receivers, dryers/filers, solenoid valves, heat exchangers, accumulators, suction filter, oil separators, evaporator pressure-regulating valve, crankcase pressure-regulating valves, hot gas bypass valves and check valves).
09.0	Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry. The student will be able to:
	09.01 Identify and explain the purpose of the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
	09.02 Bend tubing, using tube benders.
	09.03 Connect tubing using flared fittings, pressed fittings and compression fittings.
	09.04 Connect tubing, using a swaged-joint connection.
	09.05 Identify and use various types of torches.
	09.06 Identify, select and use appropriate brazing alloys, materials and skills.
	09.07 Explain the purposes and procedures for protecting piping materials and fabrication, such as valves, fittings and products from heat.
	09.08 Braze tubing while purging dry nitrogen.
	09.09 Silver-braze brass, steels and copper.
	09.10 Demonstrate an understanding of the procedures for installing pipe and tubing insulation.
	09.11 Explain the procedures required for installing heating, air-conditioning, refrigerant and ventilation accessories.
	09.12 Fabricate and leak-test the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.

	09.13 Demonstrate proper safety measures when fabricating and servicing piping, tubing and fittings.
10.0	Utilize and operate mechanical refrigeration servicing and testing equipment. The student will be able to:
	10.01 Identify the effects of superheat and sub-cooling on a system.
	10.02 Identify and explain the functions of servicing and testing equipment (such as vacuum pumps, micron gauges, EPA-approved equipment, leak detectors and charging systems).
	10.03 Operate a refrigerant recovery system.
	10.04 Apply specific safety and recovery practices for refrigerants used in the industry.
	10.05 Apply specific safety practices as they relate to handling and storing cylinders and materials.
	10.06 Explain the standards for and ways to measure, test, maintain and evacuate a mechanical heating, air-conditioning and refrigeration system.
	10.07 Evacuate the refrigerant system with various vacuum methods.
	10.08 Demonstrate compliance with Environmental Protection Agency (EPA) rules and regulations and, if possible, take the EPA test.
	10.09 Charge various air-conditioning and mechanical refrigeration systems by various methods.
	10.10 Demonstrate the effects of superheat and sub-cooling on a system utilizing test equipment (such as thermometers and gages).

Course Number: ACR0001 Occupational Completion Point: B HVAC/R Fundamentals – 250 Hours	
11.0	3
	11.01 Explain the principles of electricity.
	11.02 Explain single- and three-phase power distribution.
	11.03 Define and explain watts, ohms, volts and amps.
	11.04 Identify and explain electrical measuring tools and devices.
	11.05 Explain the standards for and ways to measure watts, resistance, voltage and amperage, using appropriate instruments or devices.
12.0	Demonstrate knowledge of electrical wiring in air-conditioning and refrigeration. The student will be able to:
	12.01 Identify and explain appropriate electrical wiring symbols.

	12.02 Draw and explain a wiring schematic diagram for a control system.
	12.03 Create a wiring schematic for an air conditioner an electric furnace, a heat pump, an oil furnace (optional) and a gas furnace.
13.0	Troubleshoot heating, air-conditioning and refrigeration electrical control systems and their components. The student will be able to:
	13.01 Identify and explain the operations of electrical control systems and their components (zone damper motors, duel fuel lock out controls, outdoor thermostats/low ambient controls, defrost controls/timers and auxiliary heating controls, contactors, relays, circuit boards, motors, solenoids, and thermostats.).
	13.02 Troubleshoot protection devices, such as fuses and breakers.
	13.03 Identify, install and troubleshoot controls for heating, air-conditioning and refrigeration systems.
	13.04 Explain the operation of different types of electromechanical communicating, humidity control, and Wi-Fi and programmable operating thermostats.
	13.05 Understand the basics of how to troubleshoot operational problems for different types of electromechanical communicating, humidity control, and Wi-Fi operating thermostats.
	13.06 Understand, install and troubleshoot invertor technology.
14.0	Select and test electrical generation and distribution components for commercial heating and air conditioning systems. The student will be able to:
	14.01 Determine wire sizes and voltage drops.
	14.02 Describe the operation of various types of transformers, including 230 vs. 208 volt issues and also voltage issues from compressor time delays.
15.0	Maintain, test and troubleshoot electrical motors and their components for commercial heating and air-conditioning systems. The student will be able to:
	15.01 Explain how alternating current is developed and draw a sine wave.
	15.02 Identify and explain single-phase and three-phase wiring arrangements.
	15.03 Explain how phase shift occurs in inductors and capacitors.
	15.04 Describe the types of capacitors and their applications.
	15.05 Explain the operation of single-phase and three-phase induction motors.
	15.06 Identify and explain the operations and applications of various types of electrical motors, including electronically commutated motors (ECM) and variable speed motors, and their components as used in heating and air-conditioning systems.
	15.07 Maintain, test and troubleshoot various types of electrical motors, including ECM and variable speed motors and their components as used in heating and air-conditioning systems.
	15.08 Demonstrate the proper use of motor testing equipment.

	15.09 Demonstrate how to reverse the rotation of a motor.

Course Number: ACR0012 Occupational Completion Point: C HVAC/R Service Practices – 250 Hours	
16.0	Utilize mechanical components of heating air-conditioning and refrigeration systems. The student will be able to:
	16.01 Evaluate metering-device performance.
	16.02 Explain the methods of compression, lubrication and compressor modulation.
	16.03 Analyze the operating condition of a compressor.
	16.04 Test, troubleshoot and correct the causes of mechanical problems in a heating, air-conditioning and refrigeration system.
	16.05 Evaluate system performance.
17.0	Operate solid-state electronics as used in heating, air-conditioning and refrigeration systems. The student will be able to:
	17.01 Explain the basic principles and functions of Direct Digital Control (DDC).
	17.02 Explain basic solid-state circuits and boards.
	17.03 Identify, test and replace circuits and boards.
	17.04 Explain codes and standards and safety requirements for working with the electrical components used in heating, air conditioning and refrigeration.
18.0	Read construction documents. The student will be able to:
	18.01 Recognize and identify basic construction drawing terms, components and symbols.
	18.02 Relate information on construction drawings to actual locations on the project.
	18.03 Recognize different classifications of construction drawings.
	18.04 Interpret and use drawing dimensions.
19.0	Assist in the installation of a residential heating and air-conditioning system and determine start-up procedures. The student will be able to:
	19.01 Read and comply with dispatch orders.
	19.02 Explain codes and ordinances.

	19.03 Assist in the installation of a heating and air-conditioning system to the manufacturer's installation and operation specifications, using a practical knowledge of duct fabrication methods.
	19.04 Determine which charging method is appropriate for a given type of system in a residential air-conditioning unit and adjust superheat and/or sub-cooling.
	19.05 Determine the temperature split/ difference across the evaporator.
	19.06 Determine the temperature split/ difference across the condenser.
	19.07 Explain the electrical and mechanical operations of the basic heat pump.
	19.08 Write a service report.
	19.09 Apply good customer-relations skills.
20.0	Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems. The student will be able to:
	20.01 Identify and explain the following heat-pump systems: air-to-air, water-to-air, water-to-water, air-to-ground (geothermal), open-loop and closed-loop.
	20.02 Determine the start-up and checkout procedures recommended by different manufacturers.
	20.03 Determine the temperature split/difference across the outdoor coil on a heat pump.
	20.04 Determine the temperature split/difference across the indoor coil on a heat pump.
	20.05 Apply good customer-relations skills.
21.0	Use combustion-type heating servicing and testing equipment. The student will be able to:
	21.01 Explain combustion theory and the safety precautions for using combustion-type-heating servicing and testing equipment.
	21.02 Identify and explain the various types of combustion-type heating servicing and testing equipment (such as draft gauge, U-tube manometer, sling psychrometer, millivolt meter and oil-furnace testing equipment).
	21.03 Use the servicing and testing equipment.
	21.04 Test, analyze and troubleshoot combustion-type-heating systems.
22.0	Troubleshoot combustion gas valves and regulators as used in heating, air-conditioning, refrigeration and ventilation systems. The student will be able to:
	22.01 Identify and discuss the safety and regulation issues and concerns.
	22.02 Explain the operations of various types of gas valves and regulators (such as low-voltage, line-voltage, pneumatic (optional), solenoid and gas and pressure regulators).
	22.03 Identify various types of gas valves and regulators.

	22.04 Determine the application of gas valves and regulators.
	22.05 Troubleshoot gas valves and regulators.
23.0	Understand the design of heating and cooling systems. The student will be able to:
	23.01 Identify and describe the steps in the system design process.
	23.02 Use construction drawings or an actual job site to obtain information needed to complete heating and cooling load estimates.
	23.03 Identify the factors that affect heat gains and losses to a building and describe how these factors influence the design process.
	23.04 Complete a load estimate to determine the heating and/or cooling load of a building.
	23.05 State the principles that affect the selection of equipment to satisfy the calculated heating and/or cooling load.
	23.06 Select heating and/or cooling equipment using manufacturers' product data.
	23.07 Identify the various types of duct systems and explain why and where each type is used.
	23.08 Demonstrate the effect of fittings and transitions on duct system design.
	23.09 Use a friction loss chart and duct sizing table to size duct.
	23.10 Install insulation and vapor barriers used in duct systems.
	23.11 Select and install refrigerant and condensate piping following proper design principles.
	23.12 Describe airflow and pressures in a basic forced-air distribution system.
	23.13 Explain the differences between propeller and centrifugal fans and blowers.
	23.14 Identify the various types of duct systems and explain why and where each type is used.
	23.15 Demonstrate or explain the installation of metal, fiberboard and flexible duct.
	23.16 Demonstrate or explain the installation of fittings and transitions used in duct systems.
	23.17 Identify and explain the operations of electrical control systems and their components (zone damper motors).
	23.18 Demonstrate or explain the use and installation of dampers used in duct systems.
	23.19 Demonstrate or explain the use and installation of insulation and vapor barriers used in duct systems.
	23.20 Identify instruments used to make measurements in air systems and explain the use of each instrument.

	23.21 Make basic temperature, air pressure and velocity measurements in an air distribution system.
	23.22 Describe the benefits of conditioned air and indoor air quality.
	23.23 Identify various professional organizations, associations and societies and explain their purposes.
24.0	(Optional) Explain the importance of employability, soft skills, entrepreneurship skills and making career plans. The student will be able to:
	24.01 Identify and demonstrate positive work behaviors, including soft skills and entrepreneurship skills, needed to be employable.
	24.02 Develop personal career plan that includes goals, objectives and strategies.
	24.03 Create and maintain a career portfolio to document knowledge, skills and experience.
	24.04 Exhibit a professional appearance through appropriate grooming and attire.
	24.05 Evaluate and compare employment opportunities that match career goals.
	24.06 Identify and exhibit traits for retaining employment.
	24.07 Identify opportunities and research requirements for career advancement.
	24.08 Research the benefits of ongoing professional development.
	24.09 Examine licensing, certification and industry credentialing requirements.

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 co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Heating, Ventilation, Air-Conditioning/Refrigeration (HVAC/R) 2**
Program Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

Career Certificate Program		
Program Number	C400420	
CIP Number	0615050112	
Grade Level	30, 31	
Program Length	600 Hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 10	Communications (Reading and Language Arts): 9

Purpose

The purpose of this program is to prepare students for employment or advanced training in the heating, ventilation, air-conditioning/refrigeration (HVAC/R) industry. The student should obtain EPA certification prior to leaving school in order to be employed in any job that requires work with refrigerants. This program focuses on broad, transferable skills, stresses the understanding of the heating, air-conditioning, refrigeration and ventilation industry and demonstrates elements of the industry such as planning, management, finance, technical and production skills, the underlying principles of technology, and health, safety and environmental issues.

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 designing, testing and repairing heating, ventilation, air-conditioning/refrigeration (HVAC/R) systems.

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

Program Structure

This program is a planned sequence of instruction consisting of two occupational completion points. The recommended sequence allows students to complete specified portions of the program for employment or to remain for advanced training. A student who completes the applicable competencies at any occupational completion point may either continue with the training program or terminate as an occupational completer.

Heating, Ventilation, Air-Conditioning/Refrigeration (HVAC/R) 1 is a core program. It is recommended that student completes Heating, Ventilation, Air-Conditioning/Refrigeration (HVAC/R) 1, or demonstrates mastery of the outcomes in that program, prior to enrollment in Heating, Ventilation, Air-Conditioning/Refrigeration (HVAC/R) 2.

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

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	ACR0013	HVAC/R Intermediate Service Practices	AC HEAT ME @7 G REFRG MECH 7 G	250 Hours
B	ACR0044 **OR** ACR0045	HVAC/R Advanced Service Practices (formerly 'Air-Conditioning, Refrigeration and Heating Technician')* **OR** HVAC/R Advanced Commercial and Industrial Service Practices (formerly 'Refrigeration Mechanic')*		350 Hours **OR** 350 Hours

***NOTE: Students may choose one of the following courses for the completion of OCP B: ACR0044 or ACR0045**

Common Career Technical Core – Career Ready Practices

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Select appropriate commercial compressors.
02.0 Test and adjust commercial evaporative condensers.
03.0 Maintain, test and troubleshoot commercial evaporators.
04.0 Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing.
05.0 Maintain, troubleshoot and repair commercial heating systems.
06.0 Discuss new HVAC/R technologies.
07.0 Interpret, use and modify construction drawings and specifications.
08.0 Troubleshoot and repair commercial heating and air-conditioning systems.
09.0 Develop an understanding of hydronic systems.
10.0 Determine the properties of air.
11.0 Use a pressure enthalpy chart to diagram refrigerant cycles.
12.0 Explain the standards for and ways to measure indoor air quality.
13.0 (Optional) Identify and understand pneumatic control systems for commercial heating and air-conditioning applications.
14.0 Develop an understanding of chilled systems.
15.0 (Optional) Maintain and repair thermal storage systems.
16.0 Understand and explain the calculation of commercial heating and air-conditioning loads.
17.0 Balance an air distribution system.
18.0 Select energy conservation equipment.
19.0 Analyze building management systems.
20.0 (Optional) Recommend alternative heating and cooling systems for various case studies.
21.0 Demonstrate knowledge of retail refrigeration systems.
22.0 Demonstrate knowledge of commercial and industrial refrigeration systems.
23.0 Demonstrate a working knowledge of electrical generation and distribution components for commercial heating and air conditioning systems.
24.0 Demonstrate a working knowledge of refrigeration-system vibration and insulation.
25.0 Apply commercial refrigeration pipe sizing and troubleshooting procedures.
26.0 Use refrigeration systems skills in commercial applications.
27.0 Demonstrate a working knowledge of refrigerated storage systems.
28.0 Diagnose, maintain and repair ice making systems.
29.0 Use refrigeration electrical system skills in commercial applications.
30.0 Maintain and troubleshoot commercial refrigeration systems.

Florida Department of Education
Student Performance Standards

Program Title: Heating, Ventilation, Air-Conditioning/Refrigeration (HVAC/R) 2
Career Certificate Program Number: C400420

Course Number: ACR0013 **Occupational Completion Point: A** **HVAC/R Intermediate Service Practices – 250 Hours**	
01.0	Select appropriate commercial compressors. The student will be able to:
01.01	Compare commercial-compressor requirements with those for residential and light commercial heating and air-conditioning systems.
01.02	Discuss appropriate commercial compressors for cooling requirements.
01.03	Describe the mechanical operation for each type of compressor.
01.04	Explain compressor lubrication methods.
01.05	Explain methods used to control compressor capacity.
01.06	Describe how compressor protection devices operate.
01.07	Perform the common procedures used when field servicing open and semi-hermetic compressors.
02.0	Test and adjust commercial evaporative condensers. The student will be able to:
02.01	Determine the proper air and fluid flow for commercial evaporative condensers.
02.02	Test and adjust the airflow for proper temperature difference.
02.03	Test and adjust the water flow for proper GPM and temperature difference.
02.04	Check for proper water treatment.
03.0	Maintain, test and troubleshoot commercial evaporators. The student will be able to:
03.01	Determine the operational requirements for evaporators used in commercial heating and air-conditioning applications.
03.02	Discuss appropriate evaporators for commercial heating and air-conditioning systems
03.03	Maintain, test and adjust commercial heating and air-conditioning accessories.

	03.04 Select the heating and air-conditioning accessories appropriate for various commercial applications.
04.0	Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing. The student will be able to:
	04.01 Identify and explain various types of heating, air-conditioning and refrigeration piping.
	04.02 Identify basic principles of sizing various heating, air conditioning, refrigeration and ventilation for various tasks.
	04.03 Explain pressure and temperature drops.
05.0	Maintain, troubleshoot and repair commercial heating systems. The student will be able to:
	05.01 Identify the components of various commercial heating systems.
	05.02 Explain the operational principles of various commercial heating systems.
	05.03 Test and analyze heating air-distribution systems.
	05.04 Maintain, troubleshoot and repair various commercial heating systems.
06.0	Discuss new HVAC/R technologies. The student will be able to:
	06.01 Follow all HVAC/R related safety precautions.
	06.02 Describe new technologies in HVAC/R installation, including variable-speed motors, heat-pipe systems, desiccant systems and gas-driven heating systems.
	06.03 Describe multi-ports and Variable Refrigerant Volume (VRV)/Variable Refrigerant Flow (VRF) systems.
	06.04 Explain how to lay out, construct and troubleshoot comfort systems.
	06.05 Test and analyze systems.
	06.06 Test and analyze heat-recovery systems and VRV/VRF.
07.0	Interpret, use and modify construction drawings and specifications. The student will be able to:
	07.01 Read mechanical plans within a set of construction drawings explain their relationship.
	07.02 Compare mechanical plans with the actual installation of duct and pipe runs, fittings and sections.
	07.03 Interpret specification documents and apply them to the plans.
	07.04 Interpret shop drawings and apply them to the plans and specifications. (Optional)
	07.05 Develop a field set of as-built drawings. (Optional)

	07.06 Identify the steps required for transferring design information to component production. (Optional)
	07.07 List and classify materials most commonly used in HVAC systems.
08.0	Troubleshoot and repair commercial heating and air-conditioning systems. The student will be able to:
	08.01 Keep a record of the installation, maintenance and repair of commercial heating and air-conditioning systems.
	08.02 Apply local, national and international codes and safety practices.
	08.03 Lay out a commercial heating and air-conditioning system.
	08.04 Lay out a typical split commercial air-conditioning system.
	08.05 Lay out a typical split commercial heating system.
	08.06 Maintain, test, analyze and repair various types of commercial heating and air-conditioning systems.
	08.07 Maintain, troubleshoot and repair water-cooled condensers

NOTE: Students may choose one of the following courses for the completion of OCP B: ACR0044 or ACR0045

Course Number: ACR0044 Occupational Completion Point: B – Option 1 HVAC/R Advanced Service Practices – 350 Hours	
09.0	Develop an understanding of hydronic systems. The student will be able to:
	09.01 Explain the terms and concepts used when working with hot-water heating systems.
	09.02 Identify the major components of hot-water heating systems.
	09.03 Explain the purpose of each component of hot-water heating systems.
	09.04 Describe the safety precautions used when working with hot water systems.
	09.05 Identify the common piping configurations used with hot water heating systems.
	09.06 Explain the principles involved and describe the procedures used in balancing hydronic systems.
	09.07 Select, calibrate and properly use the tools and instruments needed to balance hydronic systems.
	09.08 Read the pressure across a water system circulating pump.

10.0	Determine the properties of air. The student will be able to:
	10.01 Explain the principles of psychrometrics.
	10.02 Identify and explain the components and uses of a psychrometric meter.
	10.03 Identify indoor air quality concerns as related to psychrometrics, including mold detection, prevention and remediation.
	10.04 Determine the properties of air, using a psychrometric chart.
	10.05 Follow safety precautions.
	10.06 Identify and explain the different types and benefits of air filtration systems, products for improving indoor air quality.
	10.07 Fabricate, operate, maintain and troubleshoot air filtration systems, air handling systems and ventilation systems.
11.0	Use a pressure enthalpy chart to diagram refrigerant cycles. The student will be able to:
	11.01 Identify all components of the pressure enthalpy chart.
	11.02 Define enthalpy and entropy.
12.0	Explain the standards for and ways to measure indoor air quality--The student will be able to:
	12.01 Identify and explain the codes and standards regarding indoor air quality.
	12.02 Select and use indoor air quality measuring devices.
	12.03 Explain the standards for and ways to measure indoor air quality using various methods.
13.0	(Optional) Identify and understand pneumatic control systems for commercial heating and air-conditioning applications. The student will be able to:
	13.01 Identify pneumatic control systems and explain the transition to electro/pneumatic systems.
	13.02 Understand the functions of direct acting and reverse acting controls of pneumatic control systems.
14.0	Develop an understanding of chilled systems. The student will be able to:
	14.01 Explain the terms and concepts used when working with chilled-water cooling systems.
	14.02 Identify the major components of chilled-water cooling and dual-temperature water systems.
	14.03 Explain the purpose of each component of chilled-water cooling and dual-temperature water systems.
	14.04 Describe the safety precautions used when working with chilled-water systems.

	14.05 Explain the differences between reciprocating, rotary screw, scroll and centrifugal chillers.
15.0	(Optional) Maintain and repair thermal storage systems. The student will be able to:
	15.01 Apply appropriate codes, standards and safety practices.
	15.02 Describe the benefits and limitations of each type.
	15.03 Explain the operational principles of a thermal storage system.
	15.04 Identify and explain various types of thermal storage systems.
	15.05 Troubleshoot and test various types of thermal storage systems.
16.0	Understand and explain the calculation of commercial heating and air-conditioning loads. The student will be able to:
	16.01 Explain conduction as a heat-load source.
	16.02 Describe the implications of conducting and the resistance values for different types of construction materials.
	16.03 Interpret heat-transfer tables and define values U, K, C and R.
	16.04 Locate the total heat-transfer value of any surface.
	16.05 Explain infiltration and exfiltration/ventilation as a heat-load source.
	16.06 Explain a product heat-load source.
	16.07 Explain miscellaneous loads (people, motors and equipment) as heat-load sources.
	16.08 Explain the purpose of vapor barriers.
	16.09 Interpret tables of specific heat values as applied to commercial heating and air-conditioning systems.
	16.10 Understand the importance of system design and load calculation process of heating and cooling systems.
	16.11 Understand and explain the methods of installing air-movement systems.
17.0	Balance an air distribution system. The student will be able to:
	17.01 Explain the fan and pump laws.
	17.02 Use a psychrometric chart to evaluate air properties and changes in air properties.
	17.03 Explain the principles involved in the balancing of air and water distribution systems.

	17.04 Define common terms used by manufacturers when describing grilles, registers and diffusers.
	17.05 Identify and use the tools and instruments needed to balance air distribution systems.
	17.06 Change the speed of an air distribution system supply fan.
18.0	Select energy conservation equipment. The student will be able to:
	18.01 Identify and explain the operation of energy conservation equipment.
	18.02 Operate selected energy conservation equipment.
19.0	Analyze building management systems. The student will be able to:
	19.01 Identify the major components of a building management system and describe how they fit together.
	19.02 Explain a basic direct digital controller.
20.0	(Optional) Recommend alternative heating and cooling systems for various case studies. The student will be able to:
	20.01 Describe alternative technologies for heating such as in-floor, direct-fired makeup unit (DFMU), solar, air turnover, corn or wood pellet burners, waste oil/multi-fuel and fireplace inserts.
	20.02 Describe alternative technologies for heating and cooling such as ductless systems, computer rooms, chilled beams and multi-zone.

NOTE: Students may choose one of the following courses for the completion of OCP B: ACR0044 or ACR0045

Course Number: ACR0045 Occupational Completion Point: B – Option 2 HVAC/R Advanced Commercial and Industrial Service Practices – 350 Hours	
21.0	Demonstrate knowledge of retail refrigeration systems. The student will be able to:
	21.01 Describe the mechanical refrigeration cycle as it applies to retail refrigeration systems.
	21.02 Explain the differences in refrigerants and applications in low-, medium-, high-temperature, flammable and toxic refrigeration systems.
	21.03 Identify and describe the primary refrigeration cycle components used in retail refrigeration systems.
	21.04 Identify and describe the supporting components and accessories used in retail refrigeration systems.
	21.05 Describe the various methods of defrost used in retail refrigeration systems.
	21.06 Identify and describe the applications for the various types of retail refrigeration systems.

	21.07 Describe the control system components used in retail refrigeration systems.
	21.08 Explain the operating sequence of a retail refrigeration system.
	21.09 Interpret wiring diagrams and troubleshooting charts to isolate malfunctions in retail refrigeration systems.
22.0	Demonstrate knowledge of commercial and industrial refrigeration systems. The student will be able to:
	22.01 Identify different types of refrigerated coolers and display cases and describe each one's common application.
	22.02 Compare the basic components used in commercial/industrial refrigeration systems with those used in retail refrigeration systems.
	22.03 Identify single, multiple and satellite compressor systems; describe the applications, installation considerations and advantages and disadvantages of each type.
	22.04 Identify packaged condensing units and unit coolers; describe their applications, operation and installation considerations.
	22.05 Identify two-stage and inverter compressors and explain their operation and applications.
	22.06 Identify the various accessories used in commercial refrigeration systems and explain why each is used and where it should be installed in the system.
	22.07 Identify the various refrigeration control devices and explain the purpose of each type and how it works.
23.0	Demonstrate a working knowledge of electrical generation and distribution components for commercial heating and air conditioning systems. The student will be able to:
	23.01 Calculate loads and design and lay out a commercial refrigeration system.
	23.02 Identify and explain commercial refrigeration-pressure-regulation devices, controls and components.
	23.03 Test and troubleshoot refrigerant-pressure-regulating devices, controls and components.
	23.04 Apply local and national codes and mechanical safety practices.
24.0	Demonstrate a working knowledge of refrigeration-system vibration and insulation. The student will be able to:
	24.01 Describe the applications of vibration eliminators.
	24.02 Identify and select the correct insulation for commercial application.
25.0	Apply commercial refrigeration pipe sizing and troubleshooting procedures. The student will be able to:
	25.01 Determine the capacities of refrigerant lines, including the amounts they will hold, equivalent lengths of fittings and the total effective length for various pipelines.
	25.02 Identify and apply industry approved installation procedures.

	25.03 Troubleshoot refrigeration pipe sizing problems.
	• Explain the use of traps in suction line risers.
	• Explain pressure drop.
	• Calculate pressure drop in liquid line risers.
	• Size double risers, hot gas lines and liquid lines from condenser to receiver.
26.0	Use refrigeration systems skills in commercial applications. The student will be able to:
	26.01 Identify and apply the safety practices used with commercial refrigeration systems.
	26.02 Apply refrigeration-systems skills to commercial refrigeration systems.
	• Perform dehydration, evacuation and recovery procedures.
	• Interpret blueprints and mechanical drawings.
	• Service and charge a refrigeration system.
	• Test, analyze and replace compressors.
	• Retrofit alternative refrigerants and oils.
27.0	Demonstrate a working knowledge of refrigerated storage systems. The student will be able to:
	27.01 Identify and differentiate among various types of cases, such as service cases and self-service cases.
	27.02 Explain the operation of air screen freezers, glass door freezers, coffin cases and walk in coolers.
	27.03 Differentiate among medium-temperature, low-temperature and ultralow-temperature systems.
	27.04 Explain various defrost methods.
	27.05 Maintain, test and troubleshoot defrost components.
	27.06 Identify and explain the components of various refrigerated storage systems.
	27.07 Maintain, test and troubleshoot various refrigerated storage system components.
28.0	Diagnose, maintain and repair ice making systems--The student will be able to:
	28.01 Identify and explain various types and operations of ice making systems.

	28.02 Maintain, test, troubleshoot and repair various types of ice making systems, following the manufacturers' recommendations.
	28.03 Identify and explain the different types of water treatment methods and systems.
	28.04 Analyze water to identify water problems and the proper treatments.
	28.05 Install, service and repair ice machines and specialty refrigeration systems.
29.0	Use refrigeration electrical system skills in commercial applications. The student will be able to:
	29.01 Apply electrical safety practices for commercial refrigeration systems.
	29.02 Apply refrigeration electrical system skills to commercial refrigeration systems:
	• Interpret symbols of electrical components and diagrams.
	• Interpret schematics and diagrams.
	• Apply electrical theory and calculations.
	• Explain the principles of designing electrical systems.
	• Test and troubleshoot single- and three-phase motors and variable speed electronic commutated motors (ECM).
	29.03 Test the solid state components used in commercial refrigeration systems.
	29.04 Troubleshoot and diagnose the electrical circuits used in commercial refrigeration systems.
	29.05 Test and troubleshoot the thermostatic controls used in commercial refrigeration systems.
30.0	Maintain and troubleshoot commercial refrigeration systems. The student will be able to:
	30.01 Follow appropriate safety precautions for commercial refrigeration systems.
	30.02 Identify and explain the operations of various types of commercial refrigeration systems and applications, such as single, multiplex and cascade systems.
	30.03 Maintain and troubleshoot various types of commercial refrigeration systems.

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Electricity 1**
Program Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

Career Certificate Program		
Program Number	C400500	
CIP Number	0645030208	
Grade Level	30,31	
Program Length	750 Hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

The purpose of this program is to prepare students for employment or advanced training in a variety of electrical construction industries.

This program focuses on broad, transferable skills, stresses the understanding of all aspects of the electricity industry, and demonstrates such elements of the industry as planning, management, finance, technical and production skills, underlying principles of technology, labor issues, community issues, and health, safety, and environmental issues.

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.

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

Program Structure

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

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

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	BCV0603	Electrician Helper	ELECTRICAL @7 7G IND ENGR 7G TEC ED 1@2 ENG&TEC ED 1@2	300 Hours
B	BCV0640	Residential Electrician	ELECTRICAL @7 7G	450 Hours

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Explain the importance of health, safety, environmental stewardship and related regulatory compliance.
02.0 Identify, use and maintain the tools and accessories used in the electrical industry.
03.0 Demonstrate an understanding of basic Direct-Current (DC) electrical-circuit skills.
04.0 Apply mathematics knowledge and skills to electricity.
05.0 Demonstrate an understanding of basic electricity.
06.0 Read and interpret basic electric codes.
07.0 Apply further mathematics knowledge and skills to electricity.
08.0 Demonstrate further understanding of electricity.
09.0 Demonstrate analytical and trouble shooting skills related to electrical principles.
10.0 Demonstrate proficiency in electrical math problems and skills.
11.0 Demonstrate an understanding of Alternating Current (AC) circuit skills.
12.0 Explain the importance of employability and entrepreneurship skills.
13.0 Install residential wiring.
14.0 Install residential wiring systems.

Florida Department of Education
Student Performance Standards

Program Title: Electricity 1
Career Certificate Program Number: C400500

Course Number: BCV0603 **Occupational Completion Point: A** **Electrician Helper – 300 Hours**	
01.0	Explain the importance of health, safety, environmental stewardship and related regulatory compliance. The student will be able to:
01.01	Understand the role and purpose of the Occupational Safety and Health Administration (OSHA) rules and regulations.
01.02	Clean the work area and maintain it in a safe condition.
01.03	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.04	Identify and operate workplace safety electrical devices.
01.05	Identify health related problems that may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
01.06	Explain emergency procedures to follow in response to workplace accidents.
01.07	Create a disaster and/or emergency response plan for specific incidences.
01.08	Explain the importance of CPR (CardioPulmonary Resuscitation) and first aid.
01.09	Describe "Right-to-Understand" Law as recorded in (29 CFR.1910.1200).
02.0	Identify, use and maintain the tools and accessories used in the electrical industry. The student will be able to:
02.01	Identify and select tools, equipment and materials to complete a job.
02.02	Drill holes in metal, wood and concrete for electrical installations.
02.03	Determine the layout of electrical devices, complying with local, state and national electric code regulations.
02.04	Install the following, complying with the appropriate local, state or national electric codes: • Conductors and cable. • Standard outlets and switch boxes. • Cord connections on equipment. • Cords, switches, receptacles and dimmers, including a single-pole switched lighting circuit, a three-way switched lighting circuit and a four-way combination circuit.

03.0	Demonstrate an understanding of basic Direct Current (DC) electrical circuit skills. The student will be able to:
	03.01 Define the following terms: voltage, current, resistance and power.
	03.02 Measure voltage, current and resistance using industry standard electrical measuring devices.
	03.03 Analyze and explain series, parallel, and series parallel (combination) circuits.
	03.04 Draw each type of circuit and calculate the circuit values.
	03.05 Explain and apply Ohm's Law.
	03.06 Compute conductance and resistance of conductors.
04.0	Apply mathematics knowledge and skills to electricity. The student will be able to:
	04.01 Demonstrate knowledge of arithmetic operations.
	04.02 Analyze and apply data and measurements to solve problems and interpret documents.
	04.03 Construct charts, tables and graphs using functions and data.
05.0	Demonstrate an understanding of basic electricity. The student will be able to:
	05.01 Relate electricity to the nature of matter.
	05.02 Describe various ways that electricity is produced.
	05.03 Explain the magnetic properties of circuits and devices.
	05.04 Explain the principles of electromagnetism.
06.0	Read and interpret basic electric codes. The student will be able to:
	06.01 Describe the importance of following the local, state and national electric codes.
	06.02 Read and interpret basic electric codes, wiring plans and specifications.
	06.03 Identify licensure requirements for electrical occupations.
	06.04 Demonstrate knowledge of National Fire Protection Association (NFPA) 70E and how it relates to job safety.
07.0	Apply further mathematics knowledge and skills to electricity. The student will be able to:
	07.01 Demonstrate and solve basic algebraic formulas related to electricity.

	07.02 Solve basic trigonometric functions related to electrical theory.
	07.03 Explain basic Alternating Current (AC) theory and solve related mathematical problems using appropriate test equipment.
	07.04 Solve math related problems from measurements on training aids.
08.0	Demonstrate further understanding of electricity. The student will be able to:
	08.01 Explain how voltage is produced by chemical, mechanical, thermal, photoelectric and piezo electric means.
09.0	Demonstrate analytical and trouble shooting skills related to electrical principles. The student will be able to:
	09.01 Identify conditions and resolutions to overcurrent and ground fault conditions in electrical circuits.
	09.02 Discuss the dangers, conditions and resolutions to short circuit and arc fault conditions in electrical circuits.

Course Number: BCV0640 **Occupational Completion Point: B** **Residential Electrician – 450 Hours**	
10.0	Demonstrate proficiency in electrical math problems and skills. The student will be able to:
	10.01 Calculate wiring costs.
	10.02 Calculate voltage drop.
	10.03 Determine ampacity correction factors.
	10.04 Calculate conduit fill.
	10.05 Calculate box fill.
	10.06 Calculate range loads.
11.0	Demonstrate an understanding of Alternating Current (AC) circuit skills. The student will be able to:
	11.01 Identify the physical and electrical characteristics of capacitors and inductors.
	11.02 Demonstrate proficiency in measuring, testing and connecting a transformer.
	11.03 Analyze and apply the principles of transformers to AC circuits.
	11.04 Identify the properties of an AC signal. (optional)

	11.05 Identify AC sources.
12.0	Explain the importance of employability and entrepreneurship skills. The student will be able to:
	12.01 Identify and demonstrate positive work behaviors needed to be employable.
	12.02 Develop personal career plan that includes goals, objectives and strategies.
	12.03 Examine licensing, certification and industry credentialing requirements.
	12.04 Maintain a career portfolio to document knowledge, skills and experience.
	12.05 Evaluate and compare employment opportunities that match career goals.
	12.06 Identify and exhibit traits for retaining employment.
	12.07 Identify opportunities and describe requirements for career advancement.
	12.08 Describe the benefits of ongoing professional development.
	12.09 Examine and describe entrepreneurship opportunities as a career planning option.
13.0	Install residential wiring. The student will be able to:
	13.01 Identify residential wiring requirements and specifications in accordance with a wiring plan.
	13.02 Identify electrical symbols in construction documents.
	13.03 Draw a residential wiring plan, using electrical wiring symbols.
	13.04 Identify and install a recessed lighting fixture, a fluorescent lighting fixture and a surface lighting fixture according to the specifications, complying with the appropriate local, state and national electric codes.
	13.05 Identify, install and wire a duplex receptacle outlet circuit, a split wired duplex receptacle outlet circuit, and a special purpose receptacle outlet circuit, a Ground Fault Circuit Interrupter (GFCI) receptacle or circuit breaker, and an Arc Fault Circuit Interrupter (AFCI) receptacle or circuit breaker, according to the specifications, complying with the appropriate local, state and national electric codes.
14.0	Install residential wiring systems. The student will be able to:
	14.01 Install and wire a low voltage signal system.
	14.02 Install conduit systems.
	14.03 Provide power for Heating, Ventilation and Air Conditioning (HVAC) equipment.

14.04	Install the following, complying with the appropriate local, state and national electric codes: • Service entrance main panel. • Service entrance meter base. • Alarm systems and smoke detectors.
14.05	Demonstrate knowledge of the requirements for the installation of a swimming pool electrical system.
14.06	Connect single-phase and three-phase transformers.
14.07	Troubleshoot residential electric circuits.

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 co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Brick and Block Masonry**
Program Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

Career Certificate Program		
Program Number	C400600	
CIP Number	0646010107	
Grade Level	30,31	
Program Length	1200 Hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 9	Communications (Reading and Language Arts): 8

Purpose

The purpose of this program is to prepare students for employment in the brick, block, and concrete masonry industry.

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 selecting and mixing mortars, laying bricks and blocks, and interpreting construction documents.

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

Program Structure

This program is a planned sequence of instruction consisting of three occupational completion points. The recommended sequence allows students to complete specified portions of the program for employment or to remain for advanced training. A student who completes the applicable competencies at any occupational completion point may either continue with the training program or terminate as an occupational completer.

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

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	BCV0332	Masonry Tender	BLDG CONST ¶ 7 ¶G TEC CONSTR ¶ 7 ¶ G TROWEL TR 7G	300 Hours
B	BCV0362	Brickmason 1		450 Hours
C	BCV0363	Brickmason 2		450 Hours

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Investigate the masonry industry.
02.0 Follow safety practices relevant to the masonry industry.
03.0 Demonstrate mathematics knowledge and skills.
04.0 Use hand tools relevant to the masonry industry.
05.0 Read construction drawings and specifications.
06.0 Describe the properties, characteristics and uses of brick.
07.0 Describe the properties, characteristics and uses of concrete block.
08.0 Erect and disassemble basic scaffolds.
09.0 Operate and maintain power equipment.
10.0 Read measurements, drawings and specifications.
11.0 Select and mix mortars and concrete.
12.0 Lay brick and/or block to the line.
13.0 Describe the various types and uses of bonding.
14.0 Clean masonry.
15.0 Identify the various methods of masonry practices.
16.0 Construct residential masonry projects.
17.0 Build foundations.
18.0 Perform construction details.
19.0 Apply grout and other reinforcement.
20.0 Install metals used in masonry.
21.0 Demonstrate advanced laying techniques.
22.0 Apply construction techniques and moisture control.
23.0 Apply quality control measures.
24.0 Demonstrate knowledge of masonry repair and restoration.
25.0 Estimate materials and cost.
26.0 Perform building layout.
27.0 Explain the importance of employability and entrepreneurship skills.

Florida Department of Education
Student Performance Standards

Program Title: **Brick and Block Masonry**
Career Certificate Program Number: **C400600**

Course Number: BCV0332 **Occupational Completion Point: A** **Masonry Tender – 300 Hours**	
01.0	Investigate the masonry industry. The student will be able to:
01.01	Summarize the history of the masonry industry.
01.02	Explain the importance of the masonry industry to the local, state and national economy.
01.03	Identify employment and advancement opportunities in the masonry industry.
01.04	Explain the factors involved in good-quality work.
01.05	Describe modern masonry materials.
02.0	Follow safety practices relevant to the masonry industry. The student will be able to:
02.01	Identify causes and types of accidents.
02.02	Explain the purpose of the Occupational Safety and Health Administration (OSHA) in jobsite safety.
02.03	Describe the OSHA "Right-to-Know" Law as recorded in (29 CFR-1910.1200)
02.04	Recognize jobsite hazards and risk assessment techniques.
02.05	Describe first-aid procedures.
02.06	Follow safety practices when using tools and equipment.
02.07	Explain the importance of hazard communications (HazCom) and Material Safety Data Sheets (MSDS).
02.08	Demonstrate the use of and care of appropriate personal protective equipment (PPE).
02.09	Demonstrate proper lifting and lowering procedures (How to properly pick up and put down materials).
03.0	Demonstrate mathematics knowledge and skills. The students will be able to:
03.01	Demonstrate knowledge of arithmetic operations.

	03.02 Analyze and apply data and measurements to solve problems and interpret documents.
	03.03 Construct charts/tables/graphs using functions and data.
04.0	Use hand tools relevant to the masonry industry. The student will be able to:
	04.01 Identify, care for and use basic hand tools.
	04.02 Read ruler to the 1/16" increment.
	04.03 Read brick-spacing rules and/or brick modular rules.
05.0	Read construction drawings and specifications. The student will be able to:
	05.01 Identify types of drawings.
	05.02 Identify symbols on the drawings.
	05.03 Read and interpret simple drawings.
	05.04 Read and interpret specifications.
	05.05 Explain the importance of following local, state and national codes and standards.
	05.06 Interpret a finished schedule.
	05.07 Use an architect's scale.
	05.08 Use construction documents to estimate material quantities.
	05.09 Demonstrate ability to make simple sketches.
06.0	Describe the properties, characteristics and uses of brick. The student will be able to:
	06.01 Explain the brick-manufacturing process.
	06.02 Identify the properties and characteristics of brick.
	06.03 Distinguish between standard and modular bricks.
	06.04 Describe the different types of bricks and their principal uses.
	06.05 Identify brick positioning in a wall.
	06.06 Build 4” brick corner return leads.

	06.07 Build a wall 3’ high and 4’ long.
	06.08
07.0	Describe the properties, characteristics and uses of concrete block. The student will be able to:
	07.01 Explain the manufacturing process of concrete block.
	07.02 Identify the properties and characteristics of concrete block.
	07.03 Describe the different types, including shapes and sizes, of concrete blocks and their principal uses.
	07.04 Build an 8” block corner return lead 3 courses high.
08.0	Erect and disassemble basic scaffolds. The student will be able to:
	08.01 Follow safety practices when working with ladders and scaffolds.
	08.02 Erect and disassemble basic scaffolds.
09.0	Operate and maintain power equipment. The student will be able to:
	09.01 Follow safety practices when using and maintaining power equipment.
	09.02 Use masonry saw with an abrasive blade to cut masonry units.
	09.03 Use masonry saw with a diamond blade to cut masonry units.
	09.04 Set up, operate and maintain power tools and equipment (mixer, handheld saw, drill, etc.).
10.0	Read measurements, drawings and specifications. The student will be able to:
	10.01 Work with denominate numbers.
	10.02 Identify the ingredients and properties of mortars.
	10.03 Convert measurements in the U.S. standard (English) system into metric equivalents.
	10.04 Read construction documents and identify basic parts of a drawing set.
	10.05 Discuss the different types of specifications used in the building industry and the sections that pertain to masonry.
11.0	Select and mix mortars and concrete. The student will be able to:
	11.01 Identify types of mortars and identify types to use on various concrete masonry units (CMU).

	11.02 Identify the ingredients and properties of mortars.
	11.03 Identify the properties and characteristics of concrete.
	11.04 Identify colored mortars (admix and factory-blended).
	11.05 Identify the types and purposes of grouts.
	11.06 Store and place materials.
	11.07 Select mortars and concrete.
	11.08 Mix mortars by hand and by machine.
	11.09 Mix concrete by hand and by machine.
	11.10 Clean up tools, equipment and the work site.
	11.11 Identify common problems found in mortar application and their uses.
12.0	Lay brick and/or block to the line. The student will be able to:
	12.01 Spread mortar for brick and/or block.
	12.02 Pull a line from established leads.
	12.03 Set up masonry materials.
	12.04 Butter head joints.
	12.05 Lay brick to the line.
	12.06 Maintain proper spacing of head and bed joints.
	12.07 Cut brick with a hammer, a brick set and a trowel.
	12.08 Point and tool joints in brick walls.
	12.09 Re-temper mortar.
	12.10 Demonstrate proper handling of materials to prevent damage.
	12.11 Repeat the above ten tasks with 8" concrete block.
13.0	Describe the various types and uses of bonding. The student will be able to:

	13.01 Define and describe pattern, structural and adhesive bonding.
	13.02 Differentiate among and use stretcher, common, English, English cross, Flemish and stack bonds.
14.0	Clean masonry. The student will be able to:
	14.01 Follow safety practices when cleaning masonry.
	14.02 Identify reasons for cleaning.
	14.03 Identify and select cleaning materials and equipment.
	14.04 Prepare cleaning solutions.
	14.05 Point new and old work.
	14.06 Prepare the area and protect surrounding area from masonry cleaning solutions.
	14.07 Clean the wall using various methods.
15.0	Identify the various methods of masonry practices. The student will be able to:
	15.01 Identify the methods of basic building layouts.
	15.02 Identify the methods of digging and pouring footings.
	15.03 Identify the methods of forming, grading and pouring concrete slabs.
	15.04 Identify the different types of reinforced masonry, flashing, wall reinforcement and ties and use proper technique for installation.
	15.05 Identify measuring tools.
	15.06 Identify power equipment.

Course Number: BCV0362
Occupational Completion Point: B
Brickmason 1 – 450 Hours

16.0	Construct residential masonry projects. The students will be able to:
	16.01 Explain the requirements for construction of various types of residential foundations.
	16.02 Identify and explain the characteristics, uses and installation techniques for brick pavers.

	16.03 Lay out and build steps, patios and decks made from masonry units.
	16.04 Describe the process of tying brick veneer to an established wall.
	16.05 Build 4" and/or 8" double-wythe brick corners.
	16.06 Build 4", 6” and 12" block corners. (Optional)
	16.07 Build reinforced masonry walls, composite walls and cavity walls.
	16.08 Erect corner poles and lay out brick coursing on story pole.
	16.09 Course brick heights.
	16.10 Build brick and/or block sills, steps, piers, pilasters, columns, brick chase, flue, paving, BBQ pits and planters. (Optional)
	16.11 Construct a brick veneer wall.
	16.12 Install precast and built-in lintels. (Optional)
	16.13 Build modular brick walls.
	16.14 Install adhered stone veneer installation. (Optional)
	16.15 Install door jams. (Optional)
17.0	Build foundations. The student will be able to:
	17.01 Describe the process of building foundation walls to floor elevations.
	17.02 Describe the process of making foundation walls waterproof, if required.
	17.03 Describe the process of installing flashing, anchor bolts, termite shields and weep holes; install vents (if a wooden floor system is used).

18.0	Perform construction details. The student will be able to:
	18.01 Build 4" and/or 8" double-wythe brick corners.
	18.02 Build reinforced masonry walls, composite walls and cavity walls.
	18.03 Course brick heights.
	18.04 Build brick and/or block sills, steps, piers, pilasters, columns, brick chase, flue, paving, BBQ pits and planters. (Optional)

	18.05 Construct a brick veneer wall.
19.0	Apply grout and other reinforcement. The students will be able to:
	19.01 Name and describe the primary ingredients in grout and their properties.
	19.02 Identify the different types of grout used in masonry work.
	19.03 Describe common admixtures and their uses.
	19.04 Describe the use of steel bar reinforcement in masonry construction.
20.0	Install metals used in masonry. The students will be able to:
	20.01 Describe the uses and installation of vertical reinforcement.
	20.02 Describe the uses and installation of different types of horizontal joint reinforcement and ties.
	20.03 Describe the uses and installation of different anchors, fasteners and embedded items.
	20.04 Describe and/or install hollow metal frames.
	20.05 Describe the functions of sills and lintels.
	20.06 Describe and/or install metal hardware.

Course Number: BCV0363 **Occupational Completion Point: C** **Brickmason 2 – 450 Hours**	
21.0	Demonstrate advanced laying technique. The student will be able to:
	21.01 Recognize the structural principles and fundamental uses of basic types of walls.
	21.02 Recognize the requirement for and function of control joints and expansion joints.
	21.03 Describe the various types of walls using proper reinforcement, jointing and bonding techniques.
	21.04 Describe how to lay out specialty structures such as maintenance holes, segmented block walls and screens.
	21.05 Identify and explain the different types of masonry arches used today.
22.0	Apply construction techniques and moisture control. The student will be able to:

	22.01 Describe the process of placing masonry around windows, doors and other openings.
	22.02 Describe the process of building pilasters and other types of bracing.
	22.03 Describe the process of installing insulation used in conjunction with masonry construction.
	22.04 Identify the need for moisture control in various types of masonry construction and describe the techniques used to eliminate moisture problems.
	22.05 Describe the process of building corbelling in a double-wythe wall.
	22.06 Describe the process of joining intersecting walls.
	22.07 Describe the process of installing flashing.
23.0	Apply quality control measures. The student will be able to:
	23.01 Describe industry standards for quality control.
	23.02 Describe how to build masonry sample panels and prisms.
	23.03 Perform a slump test.
	23.04 Describe and perform field inspections.
24.0	Demonstrate knowledge of masonry repair and restoration. The student will be able to:
	24.01 Recognize signs of deterioration in masonry structures.
	24.02 Describe the causes of efflorescence, cracking and faulty mortar joints.
	24.03 Describe the procedures for preventing and correcting efflorescence, cracking and faulty mortar joints.
	24.04 Describe the procedures for preventing and correcting water damage in basements.
	24.05 Demonstrate proper use of masonry sealers.
25.0	Estimate materials and cost. The student will be able to:
	25.01 Estimate the materials needed for a specific job.
	25.02 Estimate the cost of the materials, labor, unit/ labor costs and sales tax.
26.0	Perform building layout. The student will be able to:
	26.01 Read and interpret plot plans.

	26.02 Establish building corners.
	26.03 Check and/or establish 90-degree angles using the 3-4-5 rule.
	26.04 Use optical and laser leveling instruments, transit and leveling rod.
	26.05 Describe how to build batter boards and establish building lines and elevations.
	26.06 Describe how to dig, prepare and pour footings to local codes and standards.
27.0	Explain the importance of employability and entrepreneurship skills. The students will be able to:
	27.01 Identify and demonstrate positive work behaviors needed to be employable.
	27.02 Develop personal career plan that includes goals, objectives and strategies.
	27.03 Examine licensing, certification and industry credentialing requirements.
	27.04 Maintain a career portfolio to document knowledge, skills and experience.
	27.05 Evaluate and compare employment opportunities that match career goals.
	27.06 Demonstrate ability to complete job applications and make a resume.
	27.07 Identify and exhibit traits for retaining employment.
	27.08 Identify opportunities and research requirements for career advancement.
	27.09 Research the benefits of ongoing professional development.
	27.10 Examine and describe entrepreneurship opportunities as a career planning option.

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)

Florida SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Cabinetmaking**
Program Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

Career Certificate Program		
Program Number	C410400	
CIP Number	0648070303	
Grade Level	30,31	
Program Length	1200 Hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

The purpose of this program is to prepare students for employment in the cabinetmaking industry.

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 carpentry and cabinetmaking.

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 four occupational completion points.

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

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	BCV0200	Cabinetmaker Helper	CAB WOODWK @7 7G CARPENTRY @7 7G BLDG CONSTR @7 7G TEC CONSTR @7 7G	300 Hours
B	BCV0235	Cabinet Finisher		150 Hours
C	BCV0240	Cabinet Assembler		300 Hours
D	BCV0243	Cabinetmaker		450 Hours

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Apply shop safety skills.
02.0 Utilize manual and power tools relevant to the cabinetmaking profession.
03.0 Demonstrate mathematics knowledge and skills relevant to the cabinetmaking field.
04.0 Recommend appropriate building materials for specific scenarios.
05.0 Select appropriate fasteners and hardware for specific scenarios.
06.0 Apply occupational safety skills.
07.0 Select and use hand and power tools relevant to the cabinetmaking profession.
08.0 Read and design construction documents.
09.0 Prepare cabinets for finish.
10.0 Apply finishes.
11.0 Fasten stock and joints.
12.0 Install various countertop surfaces.
13.0 Install cabinets.
14.0 Apply laminates.
15.0 Install cabinets and components.
16.0 Identify and describe interior and exterior doors (wood and/or metal).
17.0 Plan, design and lay out casework.
18.0 Utilize power tools specific to cabinet making.
19.0 Construct joints.
20.0 Cut casework components.
21.0 Assemble casework components.
22.0 Construct cabinet drawers.
23.0 Construct cabinet doors.
24.0 Construct curved pieces.
25.0 Construct millwork details.
26.0 Use computer applications in cabinetmaking where available and applicable.
27.0 Explain the importance of employability and entrepreneurship skills.

Florida Department of Education
Student Performance Standards

Program Title: Cabinetmaking
Career Certificate Program Number: I480704

Course Number: BCV0200 **Occupational Completion Point: A** **Cabinetmaker Helper – 300 Hours**	
01.0	Apply shop safety skills. The student will be able to:
01.01	Maintain a clean, orderly and safe work area.
01.02	Transport, handle and store materials safely.
01.03	Operate a fire extinguisher.
01.04	Qualify in basic first-aid procedures.
01.05	Identify safety hazards.
01.06	Demonstrate the use and care of personal protective equipment (PPE).
02.0	Utilize manual and power tools relevant to the cabinetmaking professions. The student will be able to:
02.01	Identify various hand and power tools.
02.02	Select correct tools for specific jobs.
02.03	Clean and care for tools and equipment.
02.04	Demonstrate proficiency in the safe use of hand and power tools.
02.05	Read and use carpenter's measuring tools.
03.0	Demonstrate mathematics knowledge and skills relevant to the cabinetmaking field. The student will be able to:
03.01	Apply geometry skills to solve math problems related to cabinetmaking with and without a calculator/ phone calculator.
03.02	Demonstrate knowledge of arithmetic operations.
03.03	Analyze and apply data and measurements to solve problems and interpret documents.
04.0	Recommend appropriate building materials for specific scenarios. The student will be able to:

	04.01 Identify the grades and species of lumber and their appropriate uses.
	04.02 Identify the actual and nominal sizes of lumber.
	04.03 Identify the grades of plywood and wood products.
	04.04 Identify defects and blemishes that affect the durability and strength of lumber.
	04.05 Explain the effects of temperature extremes, chemical reaction and moisture content on building materials.
	04.06 Explain the uses of various types of engineered lumber.
05.0	Select appropriate fasteners and hardware for specific scenarios. The student will be able to:
	05.01 Identify the fasteners commonly used in cabinetmaking.
	05.02 Identify the hardware commonly used in cabinetmaking.
06.0	Apply occupational safety skills. The student will be able to:
	06.01 Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200)
	06.02 Explain the purpose of the Occupational Safety and Health Administration (OSHA).
	06.03 Identify health-related problems that may result from exposure to hazardous materials.
	06.04 Describe the proper precautions for handling hazardous materials.
	06.05 Explain eligibility and the procedures for obtaining worker's compensation.
	06.06 Explain the importance of complying with the Americans with Disabilities Act (ADA) requirements.
07.0	Select and use hand and power tools relevant to the cabinetmaking profession. The student will be able to:
	07.01 Identify the hand tools commonly used by carpenters and describe their uses.
	07.02 Use hand tools in a safe and appropriate manner.
	07.03 State the general safety rules for operating all power tools, regardless of type.
	07.04 State the general rules for properly maintaining all power tools, regardless of type.
	07.05 Identify the portable power tools commonly used by carpenters and describe their uses.
	07.06 Use portable power tools in a safe and appropriate manner.

08.0	Read and design construction documents. The student will be able to:
08.01	Use an architect's scale.
08.02	Explain the types of drawings usually included in a set of plans and list the information found on each type.
08.03	Identify the different types of lines used on construction drawings.
08.04	Identify selected abbreviations commonly used on plans.
08.05	Read and interpret plans, elevations, schedules, sections and details contained in basic construction drawings.
08.06	State the purpose of written specifications.
08.07	Conduct quantity takeoff for materials.
08.08	Design millwork and draw details in construction documents for a given scenario.

Course Number: BCV0235 **Occupational Completion Point: B** **Cabinet Finisher – 150 Hours**	
09.0	Prepare cabinets for finish. The student will be able to:
09.01	Fill nail and screw holes.
09.02	Install wood plugs in prepared holes.
09.03	Sand a cabinet and joints for finish.
09.04	Select and apply proper filler.
09.05	Sand wood surfaces for finishing.
09.06	Stain, bleach, fill and seal wood surfaces as needed.
10.0	Apply finishes. The student will be able to:
10.01	Apply various types of finishes including lacquer-based, water-based, oil-based, enamel and polyurethane.
10.02	Apply the types of finishes that the local market demands.
10.03	Observe safety precautions when applying finishes, including wearing respirator and protective clothing approved by National Institute of Occupational Safety and Health (NIOSH).

Course Number: BCV0240 Occupational Completion Point: C Cabinet Assembler – 300 Hours	
11.0	Fasten stock and joints. The student will be able to:
	11.01 Identify types of glues and fasteners and describe their applications.
	11.02 Fasten stock with glue and clamps.
	11.03 Fasten stock and joints with appropriate fasteners such as nails, staples, screws and bolts.
	11.04 Fill and finish nail and screw holes with fillers and plugs.
	11.05 Glue and clamp stock using various techniques.
12.0	Install cabinets. The student will be able to:
	12.01 Load and secure casework for hauling.
	12.02 Check walls and floors for level and plumb.
	12.03 Determine fasteners for block or walls.
	12.04 Install upper and lower cabinets and other casework.
	12.05 Fasten a suspended cabinet unit to ceiling.
	12.06 Install countertops, including sink cutouts and back splash.
	12.07 Cut and install molding and trim.
	12.08 Adjust doors and drawers.
	12.09 Clean work site.
13.0	Install various countertop surfaces. The student will be able to:
	13.01 Install solid surface countertop.
	13.02 Install wood countertop.
	13.03 Install plastic laminate countertop.

	13.04 Install stone (granite, quartz, marble, etc.), tile, stainless steel, or other type of countertop. (Optional)
14.0	Apply laminates. The student will be able to:
	14.01 Lay out and cut core stock to specifications.
	14.02 Lay out and cut laminate to specification.
	14.03 Apply adhesive.
	14.04 Apply laminate to core stock.
	14.05 Trim and file plastic laminate edges.
	14.06 Clean laminated surfaces.
	14.07 Laminate a curved surface.
	14.08 Repair laminate defects.
15.0	Install cabinets components. The student will be able to:
	15.01 Install hardware such as hinges, catches, pulls, knobs and guides on assembled cabinets.
	15.02 Install fasteners.
	15.03 Install drawers.
	15.04 Install various types of doors including overlay, lipped and flush.
	15.05 Install adjustable shelving.
	15.06 Install glass panels and metal grills.
	15.07 Install specialty hardware such as a lazy Susan, wire racks and “pull-outs”.
	15.08 Install sliding doors and track.

Course Number: BCV0243 **Occupational Completion Point: D** **Cabinetmaker – 450 Hours**	
16.0	Identify and describe interior and exterior doors (wood and/or metal). The student will be able to:

	16.01 Identify the types and parts of door systems.
	16.02 Identify door jamb components.
	16.03 Identify door hardware.
17.0	Plan, design and layout casework. The student will be able to:
	17.01 Convert measurements from English to the metric system and from the metric system to the English system.
	17.02 Draw a set of plans to scale.
	17.03 Develop a plan or procedure and a cut list for a specific job.
	17.04 Estimate the materials required for the job.
	17.05 Estimate labor and materials cost, using computer-application programs, if available.
	17.06 Select and match wood stock for compatibility of grain and color.
	17.07 Design and layout cabinets, using a Computer-Assisted Design (CAD) program, if available.
18.0	Utilize power tools specific to cabinet making. The student will be able to:
	18.01 Operate both portable and stationary power tools, observing safety precautions.
	18.02 Maintain power tools according to the manufacturer's specifications.
19.0	Construct joints. The student will be able to:
	19.01 Construct various types of joints including butt, dado, rabbeted, lap, miter, splined, tongue-and-groove and mortise-and-tenon.
	19.02 Install dowels in common wood joints.
	19.03 Install biscuit spline in common wood joints.
20.0	Cut casework components. The student will be able to:
	20.01 Cut frame stiles and rails.
	20.02 Cut end, top and bottom panels.
	20.03 Cut partitions and sleepers.
	20.04 Cut shelf panels.

	20.05 Cut skeleton frame stiles and rails.
	20.06 Cut a toe board and a back panel.
	20.07 Cut a casework top or countertop and a back splash.
	20.08 Cut drawer front, sides, back and bottom.
	20.09 Cut wood drawer guides.
	20.10 Cut solid, flexible and paneled doors.
	20.11 Route or shape casework components.
21.0	Assemble casework components. The student will be able to:
	21.01 Assemble face frame, panels, toe boards and skeleton frame.
	21.02 Fasten a top or countertop and a back splash to casework.
	21.03 Assemble drawers.
	21.04 Assemble flexible and paneled doors.
	21.05 Install shelving.
	21.06 Attach trim, molding and edge banding.
22.0	Construct cabinet drawers. The student will be able to:
	22.01 Make various types of drawers including overlay, lipped and flush.
	22.02 Construct drawer guides.
23.0	Construct cabinet doors. The student will be able to:
	23.01 Select appropriate tools and materials for project.
	23.02 Cut and glue rails, stiles and panels.
	23.03 Make solid and tambour doors.
	23.04 Make a frame and panel door.
	23.05 Band edges of solid doors.

	23.06 Construct wood-door tracks.
	23.07 Select appropriate hinges and door pulls for installation.
24.0	Construct curved pieces. The student will be able to:
	24.01 Cut a curved piece from solid stock.
	24.02 Make a curved piece by saw kerfing.
	24.03 Construct a curved piece, using curved segments.
	24.04 Construct a curved piece by laminating thin strips.
25.0	Construct millwork details. The student will be able to:
	25.01 Build shaped moldings to specifications.
	25.02 Cut built-up moldings.
	25.03 Cut a cornice.
26.0	Use computer applications in cabinetmaking where available and applicable. The student will be able to:
	26.01 Estimate labor and materials cost using cabinetmaking design software, if available.
	26.02 Set up and operate a computer numeric control (CNC) machine, if available.
27.0	Explain the importance of employability and entrepreneurship skills. The student will be able to:
	27.01 Identify and demonstrate positive work behaviors needed to be employable.
	27.02 Develop personal career plan that includes goals, objectives and strategies.
	27.03 Examine licensing, certification and industry credentialing requirements.
	27.04 Maintain a career portfolio to document knowledge, skills and experience.
	27.05 Evaluate and compare employment opportunities that match career goals.
	27.06 Identify and exhibit traits for retaining employment.
	27.07 Identify opportunities and research requirements for career advancement.
	27.08 Research the benefits of ongoing professional development.

27.09 Examine and describe entrepreneurship opportunities as a career planning option.

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 co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Plumbing**
Program Type: **Career Preparatory**
Career Cluster: **Architecture & Construction**

Career Certificate Program		
Program Number	C500500	
CIP Number	0646050312	
Grade Level	30, 31	
Program Length	1080 Hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

The purpose of the programs in this cluster is to prepare students for employment or advanced training in a variety of pipe 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 reading construction documents, understanding building codes in the pipe trades, plumbing pipe cutting and joining skills and plumbing layout and installation.

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 four occupational completion points. The recommended sequence allows students to complete specified portions of the program for employment or to remain for advanced training. A student who completes the applicable competencies at any occupational completion point may either continue with the training program or terminate as an occupational completer.

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

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	BCV0508	Helper, Plumber, Pipefitter	PLUMBIN @7 7G BLDG CONST ¶ 7 ¶ G TEC CONSTR ¶ 7 ¶ G	360 Hours
B	BCV0540	Residential Plumber		240 Hours
C	BCV0562	Commercial Plumber		240 Hours
D	BCV0596	Plumbing Applications		240 Hours

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

3. Attend to personal health and financial well being.

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

Helper, Plumber, Pipefitter

01.0 Describe career and training opportunities in the pipe trade industry.
02.0 Demonstrate a basic knowledge of the pipe trade industry.
03.0 Identify the use and care of basic tools in the pipe trade industry.
04.0 Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
05.0 Demonstrate basic mathematics knowledge and skills.
06.0 Demonstrate science knowledge and skills.
07.0 Read and interpret construction documents.
08.0 Read and interpret current pipe trade codes.

Residential Plumber

09.0 Demonstrate knowledge of basic plumbing skills.
10.0 Cut and join pipes.
11.0 Demonstrate knowledge of plumbing codes.
12.0 Read and interpret construction documents and specifications.
13.0 Layout and coordinate a job.
14.0 Layout and install, or (Optional) discuss and simulate, the installation of the first rough (underground).
15.0 Layout and install, or (Optional) discuss and simulate, the installation of the second rough (first floor & above).
16.0 Layout and install or (Optional) discuss and simulate trim out plumbing.
17.0 Explain the importance of employability and entrepreneurship skills.

Commercial Plumber

18.0 Discuss and simulate the installation of water heating and circulating systems.
19.0 Discuss and simulate the installation of interceptors and separators.
20.0 Discuss and simulate the installation of a storm drainage system.
21.0 Explain the principles of backflow cross and connection control.

Plumbing Applications

22.0 Explain the process of installing a medical gas system. (Optional)
23.0 Explain how Liquid Propane Gas (LPG) and natural gas systems work.
24.0 Repair, service and maintain plumbing systems.
25.0 Explain how to connect residential plumbing to a municipal sewer lateral. (Optional)
26.0 Apply plumbing applications to swimming pools and spas. (Optional)
27.0 Identify solar systems and their components. (Optional)
28.0 Adapt a solar system design. (Optional)

29.0 Conduct a solar site assessment. (Optional)
30.0 Maintain and troubleshoot a solar thermal system. (Optional)
31.0 Discuss the installation of solar collectors. (Optional)

Florida Department of Education
Student Performance Standards

Program Title: Plumbing
Career Certificate Program Number: C500500

Course Number: BCV0508 **Occupational Completion Point: A** **Helper, Plumber, Pipefitter – 360 Hours**	
01.0	Describe career and training opportunities in the pipe trade industry. The student will be able to:
01.01	Obtain information on current and future job opportunities in the pipe trade industry and discuss its trends.
01.02	Describe career ladders (entry, intermediate and technical level careers) in each of the pipe trade industry programs and preparation requirements.
01.03	Describe advanced training opportunities, including apprenticeship programs in each of the pipe trade industry programs.
02.0	Demonstrate a basic knowledge of the pipe trade industry. The student will be able to:
02.01	Discuss the history of pipe trades.
02.02	Identify pipes, fittings, materials and equipment related to the pipe trades.
02.03	Identify fixtures and appliances for plumbing, fire sprinkler fitting, pipe fitting and gas fitting jobs.
02.04	Define the terms used in the pipe trade industry.
03.0	Identify the use and care of basic tools in the pipe trade industry. The student will be able to:
03.01	Identify and use the basic tools, equipment and materials of the pipe trade industry.
03.02	Demonstrate the procedures/techniques for the selection, use, care and storage of tools and equipment.
03.03	Compare the various tools used for plumbing and pipe fitting.
03.04	Identify tools and equipment and the safety hazards associated with them.
04.0	Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
04.01	Explain the importance of following safety precautions when working in the pipe trade industry.
04.02	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.

	04.03 Observe safety precautions.
	04.04 Identify safe working practices and safe working conditions in the pipe trade industry.
	04.05 Explain emergency procedures to follow in response to workplace accidents.
	04.06 Demonstrate Cardiopulmonary Resuscitation (CPR) techniques. (Optional)
	04.07 Demonstrate an understanding of when and how to use first aid.
	04.08 Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200).
	04.09 Identify health related problems that may result from exposure to work related chemicals and hazardous materials, and describe the proper precautions for handling such materials.
	04.10 Discuss environmental concerns related to hazardous waste, chemical waste and biological waste disposal.
05.0	Demonstrate basic mathematics knowledge and skills. The students will be able to:
	05.01 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares and cylinders, manually and (Optional) with the use of a calculator.
	05.02 Measure tolerances on horizontal and vertical surfaces using feet and inches, fractions of inches, and (Optional) using millimeters and centimeters.
	05.03 Analyze and apply data and measurements to solve problems and interpret documents.
	05.04 Solve pipe trade related basic math problems, such as piping offsets, head pressure, Pounds per Square Inch (PSI), pressure loss, slope, flow, etc. and (Optional) using metric conversion.
	05.05 Perform plumbing math calculations by adding, subtracting, multiplying and dividing, manually and (Optional), with the use of a calculator.
06.0	Demonstrate science knowledge and skills. The student will be able to:
	06.01 Describe the effect of temperature and pressure changes, chemical reaction and moisture content on various plumbing systems.
	06.02 Explain pressure measurement in terms of PSI, inches of mercury and Kilopascal (KPA).
	06.03 Explain how to use alternating current meters and instruments in the pipe trades.
07.0	Read and interpret construction documents. The student will be able to:
	07.01 Read and interpret measuring devices.
	07.02 Draw and interpret basic isometric sketches, and (Optional) advanced isometric sketches.
	07.03 Identify the basic symbols used in the pipe trades.

	07.04 Read and interpret manufacturers' schematics and specifications.
	07.05 Interpret roof drains, leaders and drainage systems.
08.0	Read and interpret current pipe trade codes. The student will be able to:
	08.01 Describe the importance of following the local, state and national codes for plumbing, gas fitting and/or pipe fitting.
	08.02 Read and interpret current standards and codes for plumbing, gas fitting and/or pipe fitting, including the Florida Plumbing Code and the Florida Fuel Gas Code.
	08.03 Read and interpret basic building codes in the pipe trade industry and demonstrate knowledge of key codes and definitions regarding: drain, waste, vent sizing, water heaters, wet venting, stack venting, bathroom groups, maximum distance from p-trap to vent, etc.

Course Number: BCV0540 Occupational Completion Point: B Residential Plumber -- 240 Hours	
09.0	Demonstrate knowledge of basic plumbing skills. The student will be able to:
	09.01 Explain the basic theory and principles of plumbing.
	09.02 Identify:
	• Pipe and fitting
	• Pipe joining methods
	• Plumbing fixtures, appliances, materials and equipment
	• Valves by type, size, materials and application
10.0	Cut and join pipes. The student will be able to:
	10.01 Join different types of pipes (including PVC, galvanized, steel, plastic, copper and cast iron pipes) according to plumbing codes and specifications using various methods including brazing (brazing *Optional*), clamping, compression, threading, flange, flaring, gasket-joint, gluing and soldering.
	10.02 Measure, mark and cut different types of pipes using various methods.
	10.03 Thread a steel pipe by hand and with a power driven vise stand or a pipe threading machine.
	10.04 Demonstrate proficiency in using the tools, following safety practices and procedures.
11.0	Demonstrate knowledge of plumbing codes. The student will be able to:

	11.01 Describe and explain the purpose of plumbing codes.
	11.02 Apply the basic theory and principles of plumbing in relation to the codes.
	11.03 Read and locate information in the Florida Plumbing Code.
	11.04 Define and explain the terms used in the plumbing codes.
	11.05 Explain why the code may supersede the manufacturer's specifications.
12.0	Read and interpret construction documents and specifications. The student will be able to:
	12.01 Recognize and identify plumbing symbols.
	12.02 Identify basic plumbing systems from the blueprint.
	12.03 From the blueprints and specifications, identify the plumbing fixtures and materials required for the plumbing job.
	12.04 Relate the blueprint to all applicable (local, state and federal) plumbing codes.
	12.05 Cross reference all working drawings to determine the location and elevation of the piping system and duct work.
	12.06 Demonstrate trade related computer skills for blueprints and specifications.
13.0	Layout and coordinate a job. The student will be able to:
	13.01 Identify specifications.
	13.02 Make a list of materials required to lay out a job.
	13.03 Determine the work aids required and the sequence of installations, according to building plans, specifications and working drawings.
	13.04 Demonstrate proper inspection and operation techniques of any heavy equipment necessary for material handling and excavation on the construction site. (Optional)
14.0	Layout and install, or (Optional) discuss and simulate, the installation of the first rough (underground). The student will be able to:
	14.01 Layout and install or (Optional) discuss and simulate the layout of an underground plumbing system. Establish a starting point according to codes and specifications. Explain the importance of coordinating with other crafts.
	14.02 Layout and install or (Optional) discuss and simulate the installation of the building drain, waste, vent, storm drainage and water heating and circulating systems.
	14.03 Layout and install or (Optional) discuss and simulate the installation of distribution systems.
	14.04 Layout and install or (Optional) discuss and simulate the installation of a temporary water service with backflow prevention.

	14.05 Layout and install or (Optional) discuss and simulate the testing and inspection of the first rough.
15.0	Layout and install, or (Optional) discuss and simulate, the installation of the second rough (first floor & above). The student will be able to:
	15.01 Layout and install or (Optional) discuss and simulate the installation and layout of a job for the first floor and above according to codes and specifications. Explain the importance of coordinating with other crafts.
	15.02 Layout and install or (Optional) discuss and simulate the cutting of openings in walls and floors to accommodate the pipe and fittings.
	15.03 Layout and install or (Optional) discuss and simulate the installation of hangers and supports.
	15.04 Layout and install or (Optional) discuss and simulate the installation of the building drain, waste vent, storm drainage; and water heating and circulating systems.
	15.05 Layout and install or (Optional) discuss and simulate the installation of distribution systems.
	15.06 Layout and install or (Optional) discuss and simulate the testing and inspection of the second rough.
16.0	Layout and install or (Optional) discuss and simulate trim out plumbing. The student will be able to:
	16.01 Layout and install or (Optional) discuss and simulate how to distribute and place fixtures, appliances and equipment, including safety devices and control.
	16.02 Layout and install or (Optional), discuss and simulate how to trim out and install job-site fixtures, appliances and equipment including closet flanges, supply stops on water pipes, lavatory, water closets, showers, kitchen sinks, garbage disposal, ice makers, dishwashers and water heaters.
	16.03 Layout and install or (Optional) discuss and simulate how to install backflow assemblies as required by the local jurisdiction and code.
	16.04 Layout and install or (Optional) discuss and simulate how to test and inspect the final installation.
17.0	Explain the importance of employability and entrepreneurship skills. The students will be able to:
	17.01 Identify and demonstrate positive work behaviors needed to be employable.
	17.02 Develop personal career plan that includes goals, objectives and strategies.
	17.03 Examine licensing, certification and industry credentialing requirements.
	17.04 Maintain a career portfolio to document knowledge, skills and experience.
	17.05 Evaluate and compare employment opportunities that match career goals.
	17.06 Identify and exhibit traits for retaining employment.
	17.07 Demonstrate an understanding of how to calculate basic operating costs for a fictitious small plumbing business, as well as deriving a profitable labor rate for that business.

	17.08 Identify opportunities and research requirements for career advancement.
	17.09 Research the benefits of ongoing professional development.
	17.10 Examine and describe entrepreneurship opportunities as a career planning option.

Course Number: BCV0562 Occupational Completion Point: C Commercial Plumber -- 240 Hours	
18.0	Discuss and simulate the installation of water heating and circulating systems. The student will be able to:
	18.01 Explain the basic theory of domestic water heating.
	18.02 Discuss and simulate how to design, size and layout a system.
	18.03 Discuss and identify the equipment and materials needed for the job in accordance with job specifications and plumbing codes.
	18.04 Discuss and simulate how to test and inspect the system.
19.0	Discuss and simulate the installation of interceptors and separators. The student will be able to:
	19.01 Identify various types of interceptors and separators.
	19.02 Explain the theory and function of various interceptors and separators.
	19.03 Discuss and simulate how to install and maintain lint and grease traps, gas and oil separators, and sand and sediment interceptors.
20.0	Discuss and simulate the installation of a storm drainage system. The student will be able to:
	20.01 Explain the theory of roof drains, leaders and the storm drainage system.
	20.02 Size and layout a storm drainage system on a plan.
	20.03 Identify the materials needed to install a storm drainage system in accordance with job specifications and plumbing codes.
	20.04 Discuss and simulate how to layout a job on site according to job specifications and plumbing codes. Explain the importance of coordinating with other trades.
	20.05 Discuss and simulate how to test and inspect the systems.
21.0	Explain the principles of backflow and cross connection control. The student will be able to:
	21.01 Define backflow and cross connection control.

	21.02 Describe the importance of backflow and cross connection control to the health of the public.
	21.03 Identify the proper devices and assemblies for individual applications.
	21.04 Explain the "degree of hazard" principle and how it relates to the installation of devices and assemblies.

Course Number: BCV0596 Occupational Completion Point: D Plumbing Applications -- 240 Hours
22.0 Explain the process of installing a medical gas system. (Optional) The student will be able to:
22.01 Explain the procedures for:
• Installing a medical gas system in a health care facility according to applicable plumbing codes.
• Connecting medical equipment, safety devices and controls.
• Testing and inspecting medical gas systems to make sure there is no cross connection and the system is pure.
23.0 Explain how Liquid Propane Gas (LPG) and natural gas systems work. The student will be able to:
23.01 Identify materials approved for the installation of LPG and natural gas systems.
23.02 Explain how to size and lay out a job on site according to plumbing codes and manufacturer’s specifications.
23.03 Install distribution systems, including equipment, safety devices and controls.
23.04 Test and inspect the systems.
24.0 Repair, service and maintain plumbing systems. The student will be able to:
24.01 Troubleshoot and diagnose plumbing systems.
24.02 Repair and replace water service and sanitary lines.
24.03 Repair and replace water closets, ball cocks, flush valves, floats, lift rods, ball stoppers and trip levers.
24.04 Repair leaks in traps and faucets.
24.05 Repair and replace sink strainers.
24.06 Repair and replace water heaters.

	24.07 Replace and repair fixture water supply pipes.
	24.08 Reseal water closets to flanges.
	24.09 Test and inspect repaired systems.
	24.10 Clear obstructions from kitchen sink, water closet, bathtub, lavatory and sewer lines, using chemicals and tools.
25.0	Demonstrate how to connect residential plumbing to a municipal sewer lateral. (Optional) The student will be able to:
	25.01 Describe who is allowed (according to municipal codes) to tap into a sewer line.
	25.02 Excavate from the building drain to a sewer lateral.
	25.03 Connect the house drain to the sewer main.
	25.04 Test and inspect the system.
26.0	Apply plumbing applications to swimming pools and spas. (Optional) The student will be able to:
	26.01 Describe and explain the various types of piping materials and methods of installation.
	26.02 Select pumps based on swimming pool volume and pump specifications.
	26.03 Determine type of filtration system based on volume and use.
	26.04 Describe and explain how to install water heating and circulating systems for swimming pools, hot tubs and spas.
27.0	Identify solar systems and their components. (Optional) The student will be able to:
	27.01 Identify components specific to an active direct solar system. (e.g., collectors, tanks, pumps, controllers, sensors, isolation and drain valves, pressure and temperature relief valves, air vents, piping, insulation, flashing, etc.). This would apply to the components relevant to each specific type of system.
	27.02 Identify components specific to an active indirect solar system.
	27.03 Identify components specific to a passive direct solar system.
	27.04 Identify components specific to a passive indirect solar system.
	27.05 Identify components specific to a swimming pool heating solar system.
28.0	Adapt a solar system design. (Optional) The student will be able to:
	28.01 Determine active direct system components' location and system layout and configuration.

	28.02 Determine active indirect system components' location and system layout and configuration.
	28.03 Determine passive direct system components' location and system layout.
	28.04 Determine passive indirect system components' location and system layout and configuration.
	28.05 Determine solar pool system components' location and system layout and configuration.
	28.06 Determine installation sequence to optimize use of time and materials.
	28.07 Explain and discuss how to inspect all provided system components for damage prior to installation.
29.0	Conduct a solar site assessment. (Optional) The student will be able to:
	29.01 Determine the required installation area, orientation and tilt for proposed collector installation.
	29.02 Establish whether there is suitable installation area with unobstructed solar access for installing collector.
	29.03 Determine the extent of current and future shading for any proposed collector location using typical sun path calculators or similar methods.
	29.04 Determine suitable location for installing all subsystem components (all valves and ancillary equipment required for complete system installation).
	29.05 Verify that system to be installed is appropriate for the building and climate.
	29.06 Verify with the homeowner the proposed location of the collector and other major components.
30.0	Maintain and troubleshoot a solar thermal system. (Optional) The student will be able to:
	30.01 Demonstrate proficiency in using tools and materials required for maintenance and troubleshooting.
	30.02 Interpret installation manual, wiring diagrams, drawings and other specifications to plan maintenance or repair work.
	30.03 Determine evaluation points for system monitoring, maintenance and troubleshooting (i.e., sensor calibration, heat exchanger fluid integrity, pump operation).
	30.04 Identify cause of problems based on evaluation results.
	30.05 Determine what repairs or system modifications are needed to restore the system to its baseline operating conditions.
	30.06 Perform or explain how to perform any identified repairs or modifications to restore system to manufacturer's or operator's satisfaction.
31.0	Discuss the installation of solar collectors. (Optional) The student will be able to:
	31.01 Identify specific manufacturer's mounting design and materials.

31.02	Identify different collector mounting methods suitable for roof types or other installation areas.
31.03	Identify different system (in the case of ICS and thermosiphon systems, due to extra weight and components) mounting methods suitable for roof type.
31.04	Identify locations for roof/wall, foundation penetrations and structural attachments.
31.05	Determine multi-collector piping strategy.
31.06	Discuss and simulate the installation of a collector mounting device to installation area.
31.07	Explain how to lift collectors to installation area Psychomotor.
31.08	Describe and simulate how to attach mounting bracket and struts (if required) to collector.
31.09	Describe and simulate how to secure collector to collector mounting device.
31.10	Describe and simulate how to connect collector to piping.

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 co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Carpentry**
Program Type: **Career Preparatory**
Career Cluster: **Architecture & Construction**

Career Certificate Program		
Program Number	C510300	
CIP Number	0646020117	
Grade Level	30, 31	
Program Length	1200 Hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

The purpose of this postsecondary program is to prepare students for employment in the carpentry industry with an emphasis on learning fundamental carpentry skills.

This program prepares students to become carpenters that can construct, erect, install, and repair structures and fixtures made from wood and other materials. Typically, they specialize in new-home, apartment, condominium, and multi-family construction, and/or commercial buildings and structures, and remodeling. As part of a single job, they might build and set forms for footings, walls, and slabs, and frame and finish exterior and interior walls, roofs, and decks. They also build stairs, install drywall; interior trim and doors; windows; cabinets; exterior siding and trim; roofing materials, and build indoor and outdoor furniture and other structures. Often, they install finish flooring and interior wall finishes. Fully trained construction carpenters can easily switch from new construction to remodeling, and with enough construction experience become a specialty sub-contractor, or residential/building contractor.

The content includes but is not limited to developing rough and finish carpentry skills.

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

Program Structure

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

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

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	BCV0112	Introduction to Carpentry	CAB WOODWK @7 7G CARPENTRY @7 7G BLDG CONST @7 7G TEC CONSTR @7 7G	150 Hours
B	BCV0122	Rough Framing Carpentry (formerly 'Carpenter, Rough')		450 Hours
C	BCV0125	Finish Trim Carpentry		450 Hours
D	BCV0123	Foundation and Form Carpentry		150 Hours

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Apply shop and construction site safety skills.
02.0 Select, use and maintain hand tools, power tools and stationary equipment.
03.0 Apply mathematics knowledge to assist in constructing buildings, structures, and various construction and woodworking related projects.
04.0 Read, understand and create basic construction and shop drawings and/or sketches.
05.0 Select and recommend appropriate building materials for building and woodworking projects.
06.0 Select and use appropriate fasteners and hardware for specific construction and woodworking applications.
07.0 Set up and install basic rigging and scaffolding.
08.0 Identify ways that sustainable design and construction strategies impact the built environment (Optional).
09.0 Explain the importance of employability and entrepreneurship skills (Optional).
10.0 Perform site-preparation and building layout activities.
11.0 Understand how to layout and/or construct a building foundation.
12.0 Layout, cut and install framing members for a floor system (wood and/or metal).
13.0 Layout, cut and install a wall framing system (wood and/or metal).
14.0 Comply with current hurricane building codes.
15.0 Layout, cut and install a wood frame roof system.
16.0 Frame walls using cold-formed steel (Optional).
17.0 Lay out, cut and rough frame a stair system.
18.0 Identify, select and install various roofing materials for building structures.
19.0 Identify and apply appropriate thermal boundary, moisture protection and water management systems.
20.0 Install windows and exterior doors.
21.0 Install gypsum drywall.
22.0 Identify and fasten wood stock and joints.
23.0 Install cabinets and components.
24.0 Identify, interpret and describe types of interior and exterior doors types, hardware and assembly component requirements, and installation techniques based on plans and specifications.
25.0 Install interior trim and other finishes based on construction drawings, details and specifications.
26.0 Identify and install various types of interior wall and ceiling finish materials.
27.0 Layout, cut and finish a stair system.
28.0 Select and install exterior finishes.
29.0 Demonstrate building site layout to excavate for footings and foundations, and (Optional) trenching for utilities.
30.0 Erect, plumb and brace simple concrete forms with reinforcement.
31.0 Explain or identify various foundation forms.
32.0 Demonstrate an understanding of vertical concrete formwork.
33.0 Demonstrate an understanding of constructing horizontal formwork.
34.0 Explain and demonstrate how to place reinforcing bars in walls, columns, beams, girders, joists and slabs.
35.0 Discuss the transport and placement of concrete.

Florida Department of Education
Student Performance Standards

Program Title: Carpentry
Career Certificate Program Number: C510300

Course Number: BCV0112 Occupational Completion Point: A Introduction to Carpentry –150 Hours	
01.0	Apply shop and construction site safety skills. The student will be able to:
01.01	Maintain a clean, orderly and safe work area.
01.02	Transport, handle and store materials safely (e.g. forklifts, pallet jacks, etc.).
01.03	Demonstrate proper inspection and operation techniques of any heavy equipment necessary for material handling and excavation on the construction site. (Optional)
01.04	Operate a fire extinguisher.
01.05	Qualify in basic first-aid procedures and (Optional) obtain CPR/FA/AED 2 year certification.
01.06	Know how to identify and report safety hazards and (Optional) be able to fill out and report a sample Accident Report to the supervisor.
01.07	Demonstrate the inspection, proper use, inspection and care of personal protective equipment (PPE).
01.08	Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200).
01.09	Explain the purpose of the Occupational Safety and Health Administration (OSHA) and obtain an OSHA-10 Safety Certification.
01.10	Use Safety Data Sheets (SDS) to recognize health-related problems that may result from exposure to hazardous materials and chemicals.
01.11	Describe the proper procedures for handling hazardous materials.
01.12	Explain the importance of complying with the Americans with Disabilities Act (ADA) requirements.
02.0	Select, use and maintain hand tools, power tools and stationary equipment. The student will be able to:
02.01	Read and demonstrate proficiency with carpenter's measuring tools.
02.02	Identify, select and safely use various hand tools.
02.03	Identify, select and safely use hand held power tools and stationary equipment.

	02.04 Properly maintain hand tools, power tools and stationary equipment and learn about the maintenance of them.
03.0	Apply mathematics knowledge to assist in constructing buildings, structures, and various construction and woodworking related projects. The student will be able to:
	03.01 Apply geometry and algebra to solve construction related math problems.
	03.02 Use arithmetic to assist in constructing buildings, structures and woodworking projects.
	03.03 Use mathematics to solve distance, elevation, perimeter, area and volume problems.
04.0	Read, understand and create basic construction and shop drawings and/or sketches. The student will be able to:
	04.01 Identify basic construction and shop drawings, drawing terms, components and symbols.
	04.02 Interpret and apply information found on construction drawings and in specifications to assist in construction and woodworking projects.
	04.03 Recognize the different types of construction drawings.
	04.04 Use an architectural scale to determine and verify construction drawing dimensions.
	04.05 Identify, describe and state the purpose of the parts of written specifications.
	04.06 Conduct quantity takeoffs for estimating materials.
	04.07 Interpret and understand scopes of work for construction guidelines.
	04.08 Draw and/or sketch basic floor plans and/or shop drawings and elevations.
05.0	Select and recommend appropriate building materials for building and woodworking projects. The student will be able to:
	05.01 Identify the grades and species of lumber and their appropriate uses.
	05.02 Identify the actual and nominal sizes of lumber.
	05.03 Identify the grades of plywood and wood products and their uses.
	05.04 Identify defects and blemishes that affect the durability, strength and use of lumber.
	05.05 Determine how to locate and mark crowned, bowed or cupped framing lumber and how to cull it for use.
	05.06 Explain the effects of temperature differences, chemical reaction and moisture content on building materials.
	05.07 Explain and identity the uses of various types of engineered lumber.

06.0	Select and use appropriate fasteners and hardware for specific construction and woodworking applications. The student will be able to:
06.01	Identify and use fasteners and their appropriate applications commonly used in carpentry and/or cabinetmaking.
06.02	Identify and use hardware and their appropriate applications commonly used in carpentry and/or cabinetmaking.
07.0	Set up and install basic rigging and scaffolding. The student will be able to:
07.01	Identify and use rigging equipment.
07.02	Inspect rigging equipment, following safety precautions.
07.03	Estimate size, weight and center of the load.
07.04	Use rigging methods to safely move materials and equipment.
07.05	Correctly and safely assemble, inspect and disassemble scaffolding.
07.06	Inspect and safely use various types of ladders and scaffolding.
08.0	Identify ways that sustainable design and construction strategies impact the built environment. (Optional) The student will be able to:
08.01	Describe how sustainability practices impact the construction industry on the natural environment.
08.02	Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.
08.03	Recommend sustainable alternative carpentry practices as opposed to conventional carpentry practices.
08.04	Identify specific practices that can lessen adverse impacts on the environment.
09.0	Explain the importance of employability and entrepreneurship skills. (Optional) The student will be able to:
09.01	Identify and demonstrate positive work behaviors needed to be employable.
09.02	Develop personal career plan that includes goals, objectives and strategies.
09.03	Examine licensing, certification and industry credentialing requirements.
09.04	Maintain an updated resume and a portfolio to document work knowledge, skills and experience.
09.05	Evaluate and compare employment opportunities that match career path goals.
09.06	Identify and exhibit traits for retaining employment.
09.07	Identify opportunities and research requirements for career advancement.

	09.08 Research the benefits of ongoing professional development and education.
	09.09 Examine and describe entrepreneurship opportunities as a career planning option.

Course Number: BCV0122 Occupational Completion Point: B Rough Framing Carpentry – 450 Hours	
10.0	Perform site-preparation and building layout activities. The student will be able to:
	10.01 Identify building layout dimensions and elevations from plans and specifications using math skills.
	10.02 Use a transit, a builder's level and laser level.
	10.03 Erect batter boards and locate building lines.
	10.04 Locate building line points on batter boards using a builder's level and measuring instruments.
	10.05 Locate building lines on a site plan.
	10.06 Square a building, using the 3-4-5-triangle method and the diagonal (Pythagorean Theorem) method.
11.0	Understand how to layout and/or construct a building foundation. The student will be able to:
	11.01 Establish building and final grade elevations.
	11.02 Identify various types of footings and foundations.
	11.03 Identify various footing requirements used to support different types of foundations.
	11.04 Identify and select appropriate footing and foundation construction details for a specified building plan.
	11.05 Install flashing, foundation anchors and connectors, and termite shields.
	11.06 Understand and/or apply proper moisture management details for foundations, if required.
	11.07 Layout and construct a building foundation. (Optional)
12.0	Layout, cut and install framing members for a floor system (wood and/or metal). The student will be able to:
	12.01 Identify floor framing members including the subfloor.
	12.02 Identify structural support components for floor framing systems (e.g., sill plates, columns, girder beams, etc.).

	12.03 Identify various floor joist types, sizes and openings, including joists for a cantilevered floor.
	12.04 Identify various types of bridging.
	12.05 Identify various subfloor materials and fastening techniques.
	12.06 Layout, cut and install framing members for a floor system.
13.0	Layout, cut and install a wall framing system (wood and/or metal). The student will be able to:
	13.01 Identify framing members used in wall and partition construction.
	13.02 Lay out wall lines and partition locations on a floor.
	13.03 Lay out walls for studs, doors and windows.
	13.04 Identify studs, trimmers, cripples, headers, fire stops and other framing components.
	13.05 Layout, cut and build up wall partition intersecting T's, corners and headers.
	13.06 Identify various wall sheathing and/or diagonal bracing systems used in exterior walls.
	13.07 Identify and describe various insulation materials, moisture and air barrier materials and systems.
	13.08 Cut and install framing members for a wall system.
14.0	Comply with current hurricane building codes. The student will be able to:
	14.01 Install hurricane anchors and connectors using approved fasteners.
	14.02 Install hurricane clips using approved fasteners.
	14.03 Explain the purpose and importance of the codes relating to hurricanes.
	14.04 Identify and/or construct braced and structural panel shear wall assemblies.
15.0	Layout, cut and install a wood frame roof system. The student will be able to:
	15.01 Understand the terms associated with roof framing.
	15.02 Identify roof framing members used to construct various roofing types.
	15.03 Calculate the lengths of rafters for various locations.
	15.04 Identify the various types of trusses used in roof framing.

	15.05 Use a rafter framing square, speed square and calculator to lay out a roof system.
	15.06 Identify various types of sheathing used in roof construction.
	15.07 Layout, cut and frame various roof types using conventional framing methods.
	15.08 Understand various truss types and components, and how to correctly install them.
	15.09 Estimate materials needed to frame and sheath a roof.
16.0	Frame walls using cold-formed steel. (Optional) The student will be able to:
	16.01 Identify the components of a steel framing wall system.
	16.02 Identify and select the tools and fasteners used in a steel framing wall system.
	16.03 Identify applications for steel framing wall systems.
	16.04 Demonstrate the ability to build other cold-formed steel wall framing components.
	16.05 Lay out and install a steel stud structural and/or non-structural wall with openings to include bracing and blocking.
17.0	(Optional) Identify, select and install various roofing materials for building structures. The student will be able to:
	17.01 Identify the materials and methods used in roofing.
	17.02 Explain the safety requirements for roofing installation jobs.
	17.03 Install fiberglass/asphalt shingles on various roof types.
	17.04 Install roofing materials correctly in a roof valley.
	17.05 Explain how to make various roof projections watertight when using fiberglass/asphalt shingles.
	17.06 Properly cut and install hip and ridge caps using fiberglass/asphalt shingles.
	17.07 Lay out, cut and install a cricket or saddle.
	17.08 Identify and discuss techniques for installing various types of roofing systems.
	17.09 Install ISO, TPO or PVC commercial roofing.
18.0	Identify and apply appropriate thermal boundary, moisture protection and water management systems. The student will be able to:
	18.01 Identify, select and install various types of insulation material and moister/air barriers.

	18.02 Calculate the required amounts of insulation and moisture/air barriers for a structure.
	18.03 Identify, select, and install materials to provide an effective water management system for a structure.
	18.04 Identify, discuss and/or install moisture, air, and vapor barriers.
	18.05 Describe air infiltration and exfiltration control requirements.
19.0	Install windows and specialty doors The student will be able to:
	19.01 Identify various types of fixed, sliding and swinging windows including sliding, patio and French doors.
	19.02 Identify various materials and techniques used to install a window.
	19.03 Identify the requirements for a proper window installation.
	19.04 (Optional) Install a pre-hung window in accordance with manufacturer's installation instructions.
	19.05 Discuss and/or install various types of locksets.

Course Number: BCV0125 Occupational Completion Point: C Finish Trim Carpentry – 450 Hours	
20.0	Install gypsum drywall. The student will be able to:
	20.01 Identify the different types of drywall and their uses.
	20.02 Select the type and thickness of drywall required for specific installations.
	20.03 Select fasteners for drywall installation.
	20.04 Perform single-layer and multi-layer drywall installations using different types of fastening systems including nails, drywall screws and adhesives.
	20.05 Install drywall on wood or steel studs.
	20.06 Estimate material quantities for a drywall installation.
21.0	Identify and fasten wood stock and joints. The student will be able to:
	21.01 Identify types of glues, fasteners and clamps and describe their applications.
	21.02 Fasten stock with glue and various types of clamps.

	21.03 Fasten stock and joints with appropriate fasteners such as nails, staples, screws and bolts.
	21.04 Fill and finish nail and screw holes with fillers and plugs.
22.0	Install cabinets and components. The student will be able to:
	22.01 Install hardware such as hinges, catches, pulls, knobs and guides on assembled cabinets.
	22.02 Install fasteners.
	22.03 Install drawers.
	22.04 Install various types of doors including overlay, lipped and flush.
	22.05 Install adjustable shelving.
	22.06 Install specialty hardware such as wire racks and “pull-outs”.
	22.07 Install sliding doors and track.
	22.08 (Optional) Install pre-fabricated cabinets, countertops and other components.
23.0	Identify, interpret and describe types of interior and exterior doors types, hardware and assembly component requirements, and installation techniques based on plans and specifications. The student will be able to:
	23.01 Identify types and parts of door assemblies.
	23.02 Identify various types of door jambs and frames and demonstrate the installation procedures for installing selected door jambs and frames in different types of interior and exterior partitions.
	23.03 Identify different types of interior and exterior door hardware and demonstrate the installation procedures for selected types.
	23.04 Identify different types of interior and exterior doors.
	23.05 Identify the various types of locksets used on exterior doors and explain how they are installed.
	23.06 Discuss and/or install various types of locksets.
	23.07 Read and interpret door schedules.
	23.08 Install exterior and interior doors.
24.0	Install interior trim and other finishes based on construction drawings, details and specifications. The student will be able to:
	24.01 Produce a quantity take-off for interior trim and finish carpentry work.

	24.02 Identify the different types of standard moldings and describe their uses.
	24.03 Make square and miter cuts using a power miter saw.
	24.04 Select and properly use fasteners to install trim.
	24.05 Identify, select and install trim and other finish carpentry work for a project.
	24.06 Identify and select various types of flooring.
25.0	Identify and install various types of interior wall and ceiling finish materials. The student will be able to:
	25.01 Identify and install furring strips.
	25.02 Identify and install drywall and other wall finish materials.
	25.03 Identify and install finish paneling and related trim.
	25.04 Identify various types of ceiling finish materials and systems.
26.0	Layout, cut and complete a stair system. The student will be able to:
	26.01 Identify various types of stair systems.
	26.02 Identify the components of stair systems.
	26.03 Calculate the size and number of treads and risers for a stair system.
	26.04 Lay out, cut and assemble a stair system.
	26.05 Identify the types and methods of finishing stair systems.
	26.06 Identify the components of finishing a stair system.
	26.07 Layout, cut and install the finish components of a stair system.
27.0	Select and install exterior finishes. The student will be able to:
	27.01 Select and install weather resistant barriers and flashing.
	27.02 Install exterior fascia and soffit trim.
	27.03 Produce a quantity takeoff for an exterior cladding system.
	27.04 Identify and install various types of common wood exterior siding systems.

	27.05 Install fiber-cement siding and trim.
	27.06 Identify techniques for installing vinyl and metal siding.
	27.07 Identify techniques for installing stucco and masonry exterior cladding systems.
	27.08 Describe the types and applications of special exterior finish systems.
	27.09 Install one or more types of exterior finishes commonly used in your area.

Course Number: BCV0123 **Occupational Completion Point: D** **Foundation and Form Carpentry – 150 Hours**	
28.0	Demonstrate building site layout to excavate for footings and foundations, and (Optional) trenching for utilities. The student will be able to:
	28.01 Identify the different types, bearing capacities and classifications of soils.
	28.02 Identify ways to increase soil density.
	28.03 Identify strategies and equipment needed to compact loose fill soil for building foundations.
	28.04 Explain the safety considerations for digging trenches and deep excavations.
29.0	Erect, plumb and brace simple concrete forms with reinforcement. The student will be able to:
	29.01 Identify the properties of cement.
	29.02 Describe the composition of concrete.
	29.03 Estimate volumes of concrete.
	29.04 Identify types of concrete reinforcement materials and describe their uses.
	29.05 Identify various types of footings and foundations.
	29.06 Identify the parts of various types of concrete forms.
	29.07 Explain the safety procedures associated with the construction and use of concrete forms.
	29.08 Construct and brace a simple concrete form with reinforcement.
30.0	Explain or identify various foundation forms. The student will be able to:

	30.01 Identify types of foundations.
	30.02 Explain the method for installing pier forms for a foundation.
	30.03 Explain how to strip a form for reuse.
	30.04 Explain edge forms for a floor with or without foundation walls and for a stoop.
	30.05 Explain various types of curb and gutter forms.
	30.06 Identify various types of form systems used to construct elevated concrete slabs, horizontal beams and vertical columns.
	30.07 Discuss the different types and uses of flying forms for decks and shear walls.
	30.08 Understand the consequences of concrete pressure on forms.
	30.09 Identify form work components (e.g., snap ties, wedges, pigs feet, whalers, and stiff-backs, etc.).
31.0	Demonstrate an understanding of vertical concrete formwork. The student will be able to:
	31.01 Explain safety procedures associated with using concrete wall forms.
	31.02 Identify the differences in construction and uses of various types of vertical concrete wall forms.
	31.03 Identify vertical form components.
	31.04 Discuss how to, and/or plumb and brace vertical wall forms.
	31.05 Recognize various types of manufactured forms.
	31.06 Discuss how to, and/or plumb and brace a column form.
	31.07 Discuss how to, and/or plumb and brace a stair form.
	31.08 Identify and explain types of cranes.
	31.09 Construct a small vertical form with reinforcement. (Optional)
32.0	Demonstrate an understanding of constructing horizontal formwork. The student will be able to:
	32.01 Identify the different classes of slabs on grade and flatwork.
	32.02 Identify the safety hazards associated with elevated deck formwork.
	32.03 Identify the different types of elevated decks.

	32.04 Discuss the different types of flying or slip form systems.
	32.05 Describe how to install, plumb, brace and level different types of handset deck form systems.
	32.06 Describe the installation of edge forms, block outs, embedments and construction joints.
	32.07 Identify control, expansion and construction joints.
	32.08 Describe templates, keyways, bulkheads and embedments.
	32.09 Describe the proper installation of vapor barriers under slabs on grade.
	32.10 Establish finish grade and fill requirements.
33.0	Explain and demonstrate how to place reinforcing bars in walls, columns, beams, girders, joists and slabs. The student will be able to:
	33.01 Describe the applications of reinforcing bars, the uses of reinforced structural concrete and the basic processes involved in placing reinforcing bars.
	33.02 Recognize and identify the bar bends standardized by the American Concrete Institution (ACI).
	33.03 Read and interpret bar lists and describe the information found on a bar list.
	33.04 List the types of ties used in securing reinforcing bars.
	33.05 Demonstrate the proper use of common ties for reinforcing bars.
	33.06 Describe methods by which reinforcing bars may be cut and bent in the field.
	33.07 Use the tools and equipment needed for installing reinforcing bars.
	33.08 Safely use selected tools and equipment to cut, bend and install reinforcing materials.
	33.09 Explain the necessity of concrete cover in placing reinforcing bars.
	33.10 Identify lapped splices.
	33.11 (Optional) Install reinforcing bars in concrete wall, beam, girder and slab forms.
34.0	Discuss the transport and placement of concrete. The student will be able to:
	34.01 List various types of equipment used to transport and place concrete.
	34.02 Describe the factors that contribute to the quality of concrete placement.
	34.03 Explain the importance of control and expansion joints in slabs on grade.

34.04	Demonstrate the correct methods for placing and consolidating concrete into forms.
34.05	Use a screed to strike off and level concrete to the proper grade in a form.
34.06	Use tools for placing, floating and finishing concrete.
34.07	Explain when conditions permit the concrete finishing operation to start.
34.08	Name the factors that affect the curing of concrete and describe the methods used to achieve proper curing.
34.09	Care for and safely use hand and power tools used when working with concrete.
34.10	(Optional) Place concrete in a horizontal form, screed, edge and trowel finish.

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 co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Electronic Systems Integration and Automation**
Program Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

Career Certificate Program		
Program Number	C700100	
CIP Number	0647010106	
Grade Level	30, 31	
Program Length	750 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 10	Communications (Reading and Language Arts): 10

Purpose

The purpose of this program is to prepare students for employment or advanced training in a variety of occupations in the Electronics Technology Integration industry.

This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Electronics Technology Integration industry.; technical and product skills, underlying principles of technology, planning, management, finance, labor issues, community issues and health, safety and environmental issues.

The content includes but is not limited to communication, leadership skills, human relations and employability skills; and safe, efficient work practices.

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

Program Structure

This program is a planned sequence of instruction consisting of three occupational completion points. A student who completes the applicable competencies at any occupational completion point may either continue with the training or become an occupational completer.

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

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	EEV0240	Electronic System Technician	INFO TECH 7 G ELECTRONIC @7G TELCOM 7G	300 hours
B	EEV0241	Residential Electronic Systems Technician		300 hours
C	EEV0242	Commercial Electronic Systems Technician		150 hours

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Identify differences between alternating current (AC) and direct current (DC).
02.0 Identify the parameters of and the differences in voltages (e.g., 12, 24, 120, 240, 277, 480, etc.).
03.0 Identify the four basic units of measurement used with electricity and explain how they relate in Ohm's Law.
04.0 Read and identify planning tools, including construction drawings and symbols on drawings.
05.0 Identify the various types of documentation tools and methods used on a job/project.
06.0 Interpret, create or modify job/project documentation as needed to comply with design specifications.
07.0 Use and maintain hand tools, power tools and test equipment in a manner that complies with OSHA requirements and general safety best practices.
08.0 Understand the fundamentals of common building construction methodologies (wood frame, metal frame, masonry, concrete, etc.) and how they affect the installation of electronic systems and cabling.
09.0 Identify and construct common cables used in electronic systems integration.
10.0 Use fasteners, anchors and back boxes to mount cable and other equipment to structures.
11.0 Identify applicable building codes.
12.0 Demonstrate applicable safety practices.
13.0 Define the electronic systems integration and automation industry.
14.0 Explain the business fundamentals of electronic systems technology integration.
15.0 Assemble and execute the pre-wire phase of installation.
16.0 Assemble and execute the trim-out phase of installation.
17.0 Design and construct racks and cabinets.
18.0 Mount system components used in electronics integration.
19.0 Connect and configure basic network infrastructure as it relates to electronics integration and automation.
20.0 Install and configure power devices and equipment.
21.0 Install and perform basic configuration of audio sub-systems.
22.0 Install and perform basic configuration of video sub-systems.
23.0 Explain the audio/video fundamentals of various specialty spaces (e.g., cinema room, media room, home office, etc.).
24.0 Install and configure telephone and networking devices.
25.0 Install surveillance and security devices.
26.0 Install, connect, configure and test off-air/cable/satellite related devices.
27.0 Connect equipment related to integrated system control applications and understand basic control programming concepts.
28.0 Verify and test system to confirm proper operation and compliance with design specifications.
29.0 Explain the fundamentals of common residential sub-systems.
30.0 Identify the role and responsibilities of the system designer.
31.0 Apply the basics of project management.
32.0 Connect and configure basic network infrastructure as it relates to electronics integration and automation.
33.0 Connect and configure wireless networks for electronics integration and automation.
34.0 Describe the commercial applications of electronics integration and automation.
35.0 Understand how to install a commercial fire alarm system.

Florida Department of Education
Student Performance Standards

Program Title: Electronic Systems Integration and Automation
Career Certificate Program Number: C700100

Course Number: EEV0240 **Occupational Completion Point: A** **Electronic Systems Technician – 300 Hours**	
01.0	Identify differences between alternating current (AC) and direct current (DC). The student will be able to:
01.01	Explain basics of electrical distribution. (Optional)
01.02	Describe the fundamentals of AC and DC electricity.
01.03	Describe the distribution of AC and DC.
01.04	Identify the difference between single phase and three phase power. (Optional)
02.0	Identify the parameters of and the differences in voltages (e.g., 12, 24, 120, 240, 277, 480, etc.). The student will be able to:
02.01	Explain the differences in and the relationship between voltage and current; understand the implications of limiting one versus the other and how this applies to the distinctions between types of work.
02.02	Identify the difference between Class 1, Class 2 and Class 3 circuits, including voltage differences.
03.0	Identify the four basic units of measurement used with electricity and explain how they relate in Ohm's Law. The student will be able to:
03.01	Understand the basic algebra required for using Ohm's Law.
03.02	Describe the difference between watts, amperes, volts and ohms.
03.03	Apply Ohm's law and power formulas.
03.04	Explain the difference between resistance and impedance and identify resistors by their color code.
03.05	Categorize the different types of non-color coded resistors, capacitors, coils, chokes, inductors, and transformers.
03.06	Describe the relationship between inductance, capacitance, and reactance as they relate to impedance.
03.07	Calculate impedance of both series and parallel circuits.
04.0	Read and identify planning tools, including construction drawings and symbols on drawings. The student will be able to:
04.01	Describe different types of construction drawings.

	04.02 Identify symbols commonly used on construction drawings, as referenced in ANSI J-STD-710-2015: Audio, Video and Control Architectural Drawing Symbols Standard.
05.0	Identify the various types of documentation tools and methods used on a job/project. The student will be able to:
	05.01 Identify and explain the purpose of the following documentation tools: • Construction drawings • Cable schedule • Work order • Change order • Materials delivery/shipper • Time sheet • Rack/Cabinet layout drawing • Block diagram • Schematic • Software • Safety data sheets (SDS) • Punch list • As-built diagrams
	05.02 Read and interpret common company documents and typical field documents.
06.0	Interpret, create or modify job/project documentation as needed to comply with design specifications. The student will be able to:
	06.01 Create necessary job/project documentation and modify using approved methods.
	06.02 Use appropriate job/project tracking/reporting methods.
07.0	Use and maintain hand and power tools and test equipment in a manner that complies with OSHA requirements and general safety best practices. The student will be able to:
	07.01 Safely use and maintain common hand and power tools and test equipment used in electronics integration, in accordance with OSHA standards and best practices.
	07.02 Understand and apply safety practices for fall protection when using scaffolding and ladders.
08.0	Understand the fundamentals of common building construction methodologies (wood frame, metal frame, masonry, concrete, etc.) and how they affect the installation of electronic systems and cabling. The student will be able to:
	08.01 Identify electronic systems and cabling installation practices for various applications depending on the construction methodology (e.g., cable raceways and conduit in masonry, drilling pathways in framing, etc.).
	08.02 Explain and follow applicable codes/laws pertaining to the installation.
	08.03 Analyze various electronic systems and cabling installation scenarios (framing vs. concrete/masonry) and choose/apply the correct solution; troubleshoot any issues.

08.04	Explain the differences between residential and commercial applications, including occupancies, and how these affect the design and installation of integrated systems.
09.0	Identify and construct common cables used in electronic systems integration. The student will be able to:
09.01	Identify and construct/terminate the following connections: • RJ-45 (aka. 8P8C) • RJ-11 (aka. 6P4C) • RJ-25 (aka. 6P6C) • RJ-31x • Coax F • BNC • RCA • Terminal Block (aka. Captive Screw) • Solderless (e.g., forked, ring or spade) • Component Video • XLR • Fiber Optic Connections • Phone Plugs - standard, mini, sub-mini (e.g., TS, TRS, TRRS) • Speaker (e.g., banana plugs, binding posts) • Euroblock (aka. phoenix) • Crimp (e.g., jelly, beanies; aka. beans, dolphins) • IDC Insulation Displacement (e.g., 110 blocks, modular/keystone jacks, 66 blocks, krone blocks) • Speaker Twist (aka. speakON) • Soldered
09.02	Define common connector color codes for telephone, speakers, data and video according to standards TIA-568 and ANSI/CTA/CEDIA-2030-A Multi-Room Audio Cabling Standard.
10.0	Use fasteners, anchors and back boxes to mount cable and other equipment to structures. The student will be able to:
10.01	Properly use the following: • Cable fasteners • Cable trays and raceways • Threaded fasteners • Mechanical fasteners • Power actuated tool fasteners • Epoxy anchoring system
10.02	Install boxes, mud rings, cable hangers, speaker rings, stub outs and ties at appropriate heights and locations
10.03	Demonstrate an understanding of static vs. dynamic load requirements.

	10.04 Understand the load capacity of the entire system that will support the installed devices, including the materials being mounted to.
11.0	Identify applicable building codes. The student will be able to:
	11.01 Describe what National Electric Code (NEC) is and how it affects the integrated systems industry.
	11.02 Identify sections in the National Electric Code (NEC) that are applicable to low-voltage installations.
	11.03 Describe how applicable codes and the latest code changes affect job site operations.
	11.04 Identify items that can be regulated by federal, state, county, local/other codes, and Home Owners Associations (HOAs).
	11.05 Understand the application of the International Building Code (IBC) and the International Residential Code (IRC) as they relate to hole size & cable pathways in various structural members and building materials.
12.0	Demonstrate applicable safety practices. The student will be able to:
	12.01 Complete an OSHA 10 or an OSHA 30 Construction Industry training.
	12.02 Apply proper safety practices for electrical shock, personal protection, lifting, ~~l~~adders, scaffolding and first aid.
13.0	Define the electronic systems integration and automation industry. The student will be able to:
	13.01 Explain the definition and scope of the industry, including its history, trends and the most commonly installed sub-systems.
	13.02 Explain the Custom Electronic Design and Installation Association (CEDIA) history, mission and ethical standards.
	13.03 Identify the different company types including integrators, retailers, distributors, manufacturer reps, manufacturers and specialty designers.
	13.04 Identify common project stakeholders including clients, architects, interior designers, builders and other trade professionals.
	13.05 Identify the different career paths in the electronics integration and automation field.
	13.06 Identify other appropriate industry organizations, such as AVIXA, NSCA, TIA, BICSI, etc.
14.0	Explain the business fundamentals of electronic systems technology integration. The student will be able to:
	14.01 Explain small business fundamentals.
	14.02 Apply project management fundamentals.
	14.03 Apply customer service techniques.
	14.04 Explain sales, service and recurring revenue.

Course Number: EEV0241 Occupational Completion Point: B Residential Electronic Systems Technician – 300 Hours	
15.0	Assemble and execute the pre-wire phase of installation. The student will be able to:
15.01	Identify different cabling topologies used in electronic systems integration, including specs of TIA-570-D standard.
15.02	Pre-wire, label cables, and comply with codes and industry standards when installing an electronic system as specified in order to facilitate proper performance of audio, video, control and related subsystem devices.
15.03	Utilize basic EMT and PVC conduit installation methods, including bending.
15.04	Install and secure cables using industry recommended practices for bend radius, service loop length, support span, and mounting height.
16.0	Assemble and execute the trim-out phase of installation. The student will be able to:
16.01	Label installed cabling.
16.02	Trim-out an electronic system by labeling, terminating and testing cables and properly mounting and installing trim related devices in order to support installation of audio, video, control and other subsystem devices.
17.0	Design and construct racks and cabinets. The student will be able to:
17.01	Describe the difference between a rack and cabinet.
17.02	Install equipment into a rack or cabinet using proper cable management.
17.03	Install equipment into a rack or cabinet while providing for proper ventilation, power management, mounting, ergonomics and safety.
18.0	Mount system components used in electronics integration. The student will be able to:
18.01	Explain retrofitting, safety considerations, and assuring that UL standards are not changed and NEC codes are not violated during retrofit.
18.02	Identify appropriate mounting hardware.
18.03	Mount system components such as cameras, flat panel displays and projectors by installing the proper brackets, housings and mounting hardware in order to provide proper performance and safety.
19.0	Connect and configure basic network infrastructure as it relates to electronics integration and automation. The student will be able to:
19.01	Set up basic telephone devices such as handsets and intercoms in order to establish basic voice communication.
19.02	Set up basic data network devices such as switches and routers in order to facilitate basic data communication.
19.03	Install communications cabling using industry standards and recommended practices in order to create a robust, reliable network infrastructure.

	19.04 Perform the required level of cabling test procedures in order to ensure system performance meets or exceeds design specifications and client expectations.
	19.05 Secure the infrastructure by evaluating and fortifying all network cabling locations (patch panels, wiring drops, network interface devices, etc.) in order to ensure client privacy and information security.
	19.06 Design a wired and/or wireless network infrastructure using appropriate communications cabling that meets the performance requirements of the client in order to ensure long term operation and reliability.
20.0	Install and configure power devices and equipment. The student will be able to:
	20.01 Explain basics of electrical distribution. (Optional)
	20.02 Install power management devices such as surge protection devices, battery backups and power conditioners in order to ensure safe and maximized performance of installed systems.
21.0	Install and perform basic configuration of audio sub-systems. The student will be able to:
	21.01 Define audio terminology.
	21.02 Explain audio signal and interconnects (analog and digital).
	21.03 Set up audio devices such as sources, amplifiers and speakers in order to produce a desired listening experience.
22.0	Install and perform basic configuration of video sub-systems. The student will be able to:
	22.01 Define video terminology.
	22.02 Explain video signal and interconnects.
	22.03 Describe the functions of High Definition Multimedia Interface (HDMI) and how it works.
	22.04 Set up video devices such as sources and displays, in order to produce a desired viewing experience.
23.0	Explain the audio/video fundamentals of various specialty spaces (e.g., cinema room, media room, home office, etc.). The student will be able to:
	23.01 Explain design considerations and performance goals of specialty spaces.
	23.02 Describe the basic layout and configuration of a specialty space.
	23.03 Install speakers at proper locations to conform with common surround sound layouts.
	23.04 Describe the relationship between screen size and viewing distance.
	23.05 Install projection system to ensure proper image size and geometry.
24.0	Install and configure telephone and networking devices. The student will be able to:

	24.01 Set up basic telephone devices such as handsets and intercoms in order to establish basic voice communication.
	24.02 Set up basic data network devices such as switches and routers in order to facilitate basic data communication.
25.0	Install surveillance and security devices. The student will be able to:
	25.01 Install basic security and surveillance devices (e.g., cameras, sensors, central control panels, keypads, etc.) in order to provide basic monitoring of secured areas.
	25.02 Configure basic security and surveillance devices to ensure proper working order.
	25.03 Configure basic security and surveillance devices to include on-site storage devices and/or cloud-based platforms.
26.0	Install, connect, configure and test off-air/cable/satellite related devices. The student will be able to:
	26.01 Install terrestrial antenna, cable and satellite TV systems, distribution and equipment to ensure signal reception.
	26.02 Configure terrestrial antenna, cable and satellite TV systems, distribution and equipment in order to provide proper reception of TV signals.
27.0	Connect equipment related to integrated system control applications and understand basic control programming concepts. The student will be able to:
	27.01 Define control system protocols.
	27.02 Connect common control devices such as remotes, keypads, volume controls, touch screens, relays, and control processors/communication bridging devices.
	27.03 Explain the differences between control and automation.
	27.04 Describe the three common types of user interfaces, Tangible (TUIs), Graphic (GUIs), and Natural (NUIs).
	27.05 Explain the concept of a macro command.
28.0	Verify and test system to confirm proper operation and compliance with design specifications. The student will be able to:
	28.01 Review the installed system in order to confirm compliance with design specifications.
	28.02 Verify system performance by testing device and system functionality in order to confirm proper operation.
	28.03 Troubleshoot installation and sub-station issues.
29.0	Explain the fundamentals of common residential sub-systems. The student will be able to:
	29.01 Describe the fundamentals of automated lighting components and operation.
	29.02 Describe the fundamentals of motorized devices such as shades, lifts, mounts, etc.

	29.03 Describe the fundamentals of energy monitoring and management.

Course Number: EEV0242 Occupational Completion Point: C Commercial Electronic Systems Technician – 150 Hours	
30.0	Identify the role and responsibilities of the system designer. The student will be able to:
	30.01 Explain the steps in the design process.
	30.02 Explain the role of the designer.
31.0	Apply the basics of project management. The student will be able to:
	31.01 Explain the life cycle of a project.
	31.02 Explain the role of the project manager.
	31.03 Explain and define standard project management terms.
	31.04 Develop a project scope statement.
32.0	Connect and configure basic network infrastructure as it relates to electronics integration and automation. The student will be able to:
	32.01 Install communications cabling using industry standards and recommended practices in order to create a robust, reliable network infrastructure.
	32.02 Perform the required level of cabling test procedures in order to ensure system performance meets or exceeds design specifications and client expectations.
	32.03 Secure the infrastructure by evaluating and fortifying all network cabling locations (patch panels, wiring drops, network interface devices, etc.) in order to ensure client privacy and information security.
	32.04 Design a wired network infrastructure using appropriate communications cabling that meets the performance requirements of the client in order to ensure long term operation and reliability.
	32.05 Perform basic configuration (e.g., IP settings, SSID, basic security, etc.) for common network devices such as switches, routers and access points to support the performance requirements of all client devices in order to ensure proper functionality and long term reliability.
33.0	Connect and configure wireless networks for electronics integration and automation. The student will be able to:
	33.01 Survey and analyze the RF spectrum using available wireless networking tools in order to ensure performance and troubleshoot problems in a commercial environment.
	33.02 Apply knowledge of existing wireless communication protocols (802.11a/b/g/n/ac) in order to specify the proper hardware in a commercial wireless networking application.

	33.03 Ensure reliability, security and consistent performance of the wireless portion of a commercial network by proper configuration of the service set identifier (SSID), channel, encryption standards and security settings.
	33.04 Explain important considerations such as throughput, coverage areas, and client roaming when installing multiple access points
34.0	Describe the commercial applications of electronics integration and automation. The student will be able to:
	34.01 Describe common integrated system applications deployed in commercial environments.
	34.02 Explain common considerations for various types of conference room applications (e.g., huddle spaces, small meeting rooms, training facilities, large event spaces, boardroom spaces, etc.).
	34.03 Identify upcoming trends and technology in the electronics systems integration and automation industry.
	34.04 Explain the basic functionality of commercial security and alarm applications.
	34.05 Explain the different types of access control, including user level administration/management for commercial applications.
	34.06 Explain the different types of large scale video distribution technologies.
35.0	Understand how to install a commercial fire alarm system. The student will be able to:
	35.01 Understand how to install and address initiating devices (e.g., detectors, sensors, pull stations etc.).
	35.02 Understand how to install and address signaling devices (e.g., horns, strobes, speakers, etc.).
	35.03 Understand how to install and configure fire alarm panels.
	35.04 Understand and explain fire suppression systems and common methods used. (Optional)
	35.05 Understand how to test the fire alarm system.
	35.06 Understand how the fire alarm system integrates with other commercial applications.

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.

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Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.
Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Building Maintenance and Management**
Program Type: **Career Preparatory**
Career Cluster: **Architecture & Construction**

Career Certificate Program		
Program Number	C700200	
CIP Number	0646040107	
Grade Level	30-31	
Program Length	960 Hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

The purpose of this program is to prepare students for employment or advanced training in the building maintenance industry.

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 applying maintenance techniques and developing trade skills in carpentry, masonry, electricity, plumbing and air conditioning.

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 four occupational completion points.

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

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	BCV0480	Facilities Maintenance Helper	PLUMBIN @7 7G AC HEAT ME @7 G REFRG MECH 7 G CAB WOODWK @7 7G CARPENTRY @7 7G BLDG CONST @7 7G TECH CONSTR @7 7G ELECTRICAL @7 7G IND ENGR 7G TEC ED 1@2 ENG&TEC ED1@2	360 Hours
B	BCV0481	Facilities Maintenance Technician 1		180 Hours
C	BCV0482	Facilities Maintenance Technician 2		180 Hours
D	BCV0483	Facilities Maintenance Assistant Supervisor		240 Hours

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership, and effective management.

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

11. Use technology to enhance productivity.

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

Standards

After successfully completing this program, the student will:

01.0 Apply safety practices.
02.0 Identify and use hand tools.
03.0 Identify and use power tools.
04.0 Identify and classify parts, materials, hardware, and characteristics.
05.0 Understand the importance of employability skills.
06.0 Demonstrate plumbing rough in skills.
07.0 Demonstrate electrical rough in skills.
08.0 Demonstrate groundskeeping skills.
09.0 Demonstrate drywall installation and repair skills.
10.0 Demonstrate rough and finish carpentry skills.
11.0 Demonstrate tile and flooring masonry skills.
12.0 Demonstrate painting and decorating skills.
13.0 Demonstrate small engine repair.
14.0 Demonstrate appliance installation and repair skills.
15.0 Demonstrate finish electrical skills.
16.0 Demonstrate finish plumbing skills.
17.0 Demonstrate winterizing skills.
18.0 Demonstrate Heating, Ventilation and Air Conditioning (HVAC) rough in skills.
19.0 Demonstrate finish HVAC skills.
20.0 Understand the building maintenance industry and related occupational trades.
21.0 Understand the natural environment and green built environment.
22.0 Understand laws and codes applicable to the building maintenance industry.
23.0 Understand maintenance agreements, drawings, documents, and specifications and how they apply.
24.0 Understand elevator systems.
25.0 Present a capstone project using skills learned throughout the program.

Florida Department of Education
Student Performance Standards

Program Title: **Building Maintenance and Management**
Career Certificate Program Number: **C700200**

Course Number: BCV0480 **Occupational Completion Point: A** **Facilities Maintenance Helper – 360 Hours**	
01.0	Apply safety practices. The student will be able to:
01.01	Observe and comply with all applicable company and organizational safety policies and Occupational Safety and Health Administration (OSHA) rules and regulations.
01.02	Be able to demonstrate the purpose of Safety Data Sheets (SDS), formerly known as Material Safety Data Sheets (MSDS) and follow the procedures as necessary.
01.03	Identify health-related problems that may result from exposure to work-related chemicals and hazardous materials and demonstrate knowledge of the proper precautions required for handling such materials. (Refer to Safety Data Sheets)
01.04	Discuss the “Right-to-Know” law, such as with chemical or health hazards, as recorded in (29 CFR-1910.1200).
01.05	Identify and demonstrate the use of safety equipment such as lifts, fall arrest systems, fire extinguishers, scaffolds, and ladders.
01.06	Understand lockout/tagout procedures and use in the workplace.
01.07	Demonstrate appropriate safety attitudes and behaviors in the shop and on the job in the building maintenance industry.
01.08	Demonstrate the appropriate safe use and maintenance of portable and stationary power equipment in the shop and on the job.
01.09	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.10	Understand emergency procedures in response to workplace accidents.
01.11	Understand and apply workplace safety related to facility maintenance (turning a unit, pest control, etc.).
02.0	Identify and use hand tools. The student will be able to:
02.01	Select and utilize appropriate hand tools typically used in the maintenance for specific tasks in accordance with safety guidelines and standard practice.
03.0	Identify and use power tools. The student will be able to:
03.01	Select and utilize appropriate power tools and equipment for specific tasks in accordance with safety guidelines.
04.0	Identify and classify parts, materials, hardware, and characteristics. The student will be able to:

04.01	Identify materials and hardware used in residential maintenance.
04.02	Identify the various components, materials and hardware used in commercial maintenance.
04.03	Identify the various components, materials and hardware used in industrial maintenance.
04.04	Understand procedural steps on the job site for various size projects with attention to building codes, standard practice, and acceptable techniques.
05.0	Understand the importance of employability skills. The students will be able to:
05.01	Identify positive work behaviors needed to be employable.
05.02	Develop personal career plan that includes goals, objectives, and strategies.
05.03	Understand licensing, certification, and industry credentialing requirements.
05.04	Maintain a career portfolio to document knowledge, skills, and experience.
05.05	Evaluate employment opportunities that match career goals.
05.06	Exhibit traits for retaining employment.
05.07	Identify opportunities for career advancement.
05.08	Understand the benefits and necessity of ongoing professional development.
05.09	Understand leadership opportunities as a career planning option.
05.10	Conduct a job search and the requirements of the job.
05.11	Understand the consequences of poor decision making in the workplace.
05.12	Understand the importance of confidentiality in the workplace.
05.13	Understand the work benefits of healthy living habits.
06.0	Demonstrate plumbing rough in skills. The student will be able to:
06.01	Understand basic plumbing systems, materials, and uses.
06.02	Test and inspect plumbing systems.
06.03	Identify, select, and install various pipes, tubing, fittings, and connectors used in the plumbing trade for a specific project.
06.04	Replace pipes, fittings, valves, and enclosures.

	06.05 Understand complete DWV systems.
	06.06 Identify different types of venting and their uses.
	06.07 Understand Florida Plumbing Code.
	06.08 Understand copper pipe and fitting joining (solder, flare, and compression).
	06.09 Understand plumbing mathematics (degree constants, head pressure, etc.).
07.0	Demonstrate electrical rough in skills. The student will be able to:
	07.01 Identify and apply electrical safety practices and procedures when working with electrical systems.
	07.02 Identify types of wiring raceways (EMT / IMC / PVC / MC Cable / Romex / SE Cable / UF Cable).
	07.03 Understand grounding, its purpose and relation to electrical safety.
	07.04 Understand electrical loads using ohms law to determine power.
	07.05 Understand American wire gauge (AWG) and electrical equipment sizes.
	07.06 Inspect and troubleshoot network, phone, security, alarms, and internet systems.
	07.07 Inspect and troubleshoot electrical systems using testing and metering devices.
	07.08 Inspect and troubleshoot an air-conditioning system, heat exchanger, heat pump or electric water heater.
	07.09 Inspect and repair electrical systems including Ground Fault Circuit Interrupter (GFCI) circuitry.
	07.10 Install electrical components, wires, conduits, boxes, and cap nuts relating to residential & commercial applications.
	07.11 Install GFCI's.
	07.12 Install switches, plugs, lights, and sensors.
	07.13 Install conduit, pipe, shielded electrical cable and electrical boxes in a project.
08.0	Demonstrate groundskeeping skills. The student will be able to:
	08.01 Understand the need for maintenance of plants and ground coverings.
	08.02 Identify and use groundskeeping tools.
	08.03 Identify automation systems and understand operation and maintenance procedures.

	08.04 Understand the application of pesticides, herbicides, and fertilizers and their importance to groundskeeping.
	08.05 Understand and use safety processes while performing groundskeeping activities.
	08.06 Identify gate and fence components/systems.
	08.07 Inspect, troubleshoot, and repair fences and gates.
	08.08 Understand pools and pumps.
	08.09 Troubleshoot and repair irrigation systems, pipes, and controllers.
	08.10 Troubleshoot and repair/replace pumps, valves, controllers, sensors, and associated systems.
09.0	Demonstrate drywall installation and repair skills. The students will be able to:
	09.01 Compute yards, feet, inches, and fractions of inches.
	09.02 Compute square yards and square feet of walls and surfaces for drywall installation.
	09.03 Calculate the spread rate of finish material.
	09.04 Read a ruler and a tape measure accurately.
	09.05 Prepare, mask, and tape areas to be drywalled.
	09.06 Cut and install drywall – Level 0, no finish.
	09.07 Tape and finish joints and angles – Level 1.
	09.08 Apply a thin layer of joint compound over corner beads, fasteners, tape, and joints – Level 2.
	09.09 Apply a second layer of joint compound – Level 3.
	09.10 Apply a third layer of joint compound, sand, and prime. Use appropriate PPE. – Level 4.
	09.11 Apply a skim coat of compound over the sanded Level 4 finish. – Level 5.
	09.12 Apply various textures: knockdown, orange peel, and acoustic finishes.
	09.13 Clean and store tools and equipment.

Course Number: BCV0481 **Occupational Completion Point: B** **Facilities Maintenance Technician 1 – 180 Hours**	
10.0	Demonstrate rough and finish carpentry skills. The student will be able to:
10.01	Discuss the carpentry trade and explain the duties of a carpenter.
10.02	Identify and use building materials, fasteners, and adhesives.
10.03	Use and maintain hand and power tools.
10.04	Read and understand approved plans and specifications for residential and commercial projects.
10.05	Apply linear and distance measurements, leveling, plumbing, and squaring techniques.
10.06	Understand the potential hazards involved and proper protective measures/PPE.
10.07	Understand thermal and moisture protection and mitigating measures.
10.08	Understand roofing materials.
10.09	Understand windows and interior / exterior doors and door hardware.
10.10	Understand exterior finishes.
10.11	Understand drywall and apply finishes.
10.12	Understand cabinets and built-in fabrications.
10.13	Understand window, door, floor, and ceiling trim.
10.14	Understand metal stud framing.
10.15	Understand suspended ceilings.
11.0	Demonstrate tile flooring masonry skills. The student will be able to:
11.01	Describe the flooring masonry trade as it relates to maintenance.
11.02	Identify and select basic masonry tools and equipment.
11.03	Use, maintain and store hand tools, power tools and equipment safely and in proper working order.
11.04	Read and interpret measurements, drawings, and specifications for flooring projects.

11.05	Demonstrate safe and proper procedures for set up/tear down and maintaining flooring work sites and projects.
11.06	Utilize the tools and equipment used for mixing mortar.
11.07	Understand the factors that affect the consistency of cementitious mortars and grouts.
11.08	Lay out square corners using the 3-4-5 (or Pythagorean Theorem) and building instrument methods for flooring projects.
11.09	Lay out and install floor tile and grout.
11.10	Lay out and install wall tile and grout.
11.11	Identify various masonry units and installation techniques.
11.12	Implement the methods of putting up the line.
11.13	Utilize pointing tools to strike mortar joints.
11.14	Identify and use the various types of trowels and tools.
11.15	Mix and apply stucco to a project.
12.0	Demonstrate painting and decorating skills. The student will be able to:
12.01	Compute yards, feet, inches, and fractions of inches.
12.02	Compute square yards and square feet of walls and surfaces for drywall installation.
12.03	Read and record measurements from a ruler and a tape measure.
12.04	Calculate the spread rate of finish material and determine the quantity needed for the project.
12.05	Determine the type of paint required: alkyd, urethane, latex, oil, etc.
12.06	Apply the correct level of finish: gloss, semi-gloss, eggshell, satin, flat, etc.
12.07	Prepare surfaces for application of finishes.
12.08	Prepare, mask, and tape areas surrounding those to be painted.
12.09	Identify and use various painting tools and equipment.
12.10	Properly assemble and use an extension ladder, step ladder and a scaffold.
12.11	Understand various painting and application techniques.

	12.12 Apply finishes to a project including primers, paints, sealants, stains, varnishes, wall coverings and textures.
	12.13 Use appropriate techniques and materials for clean-up.
	12.14 Use appropriate techniques for tool and material storage.
Course Number: BCV0482 Occupational Completion Point: C Facilities Maintenance Technician 2 – 180 Hours	
13.0	Demonstrate small engine repair. The student will be able to:
	13.01 Troubleshoot and repair small battery motors.
	13.02 Troubleshoot and repair small 2-cycle motors.
	13.03 Troubleshoot and repair small 4-cycle motors (gasoline and diesel).
14.0	Demonstrate appliance installation and repair skills--The student will be able to:
	14.01 Understand the functions of various appliances and the installation, setup, and operation of appliances.
	14.02 Understand and demonstrate installation and repair of washers and dryers.
	14.03 Understand and demonstrate installation and repair of dishwashers and disposals.
	14.04 Understand and demonstrate installation and repair of ice makers, forced air ventilation, and over range hoods.
	14.05 Understand and demonstrate installation and repair of ranges, cooktops, and grills.
	14.06 Understand and demonstrate installation and repair of coffee makers, blenders, mixers, slicers, and other small commercial appliances likely to be encountered in the workplace.
15.0	Demonstrate finish electrical skills. The student will be able to:
	15.01 Apply electrical theory to inspecting and wiring projects.
	15.02 Understand branch circuit systems.
	15.03 Understand various phases of electrical generation and the transportation and distribution of electricity to sub stations for industrial, business, and residential uses (under 480 volts).
	15.04 Install electrical components relating to residential and commercial applications.
	15.05 Troubleshoot and inspect electrical systems.

	15.06 Inspect and repair electrical systems.
	15.07 Inspect and troubleshoot grounding systems.
	15.08 Inspect and troubleshoot solar, generator, and alternative energy systems.
	15.09 Wire an air-conditioning system, heat exchanger, heat pump or electric water heater into an electrical supply and properly size wire and overcurrent protection.
	15.10 Install a meter, distribution panel or breaker panel.
16.0	Demonstrate finish plumbing skills. The student will be able to:
	16.01 Install bathroom fixtures and hardware such as lavatories, water closets, urinals, showers, bathtubs, and traps.
	16.02 Install kitchen fixtures and hardware such as sinks, garbage disposals, faucets, dishwasher, icemaker, and hot water heater tanks.
	16.03 Understand the design and layout of a domestic solar hot water system.
	16.04 Lay out and install a water distribution (supply) system for a project.
	16.05 Lay out and install a Drain, Waste and Vent (DWV) system for a project.
	16.06 Troubleshoot and repair gas and electric water heater storage tanks.
	16.07 Troubleshoot and repair gas tankless water heaters.
	16.08 Understand hot water recirculation systems.
	16.09 Understand solar hot water systems.
Course Number: BCV0483 Occupational Completion Point: D Facilities Maintenance Assistant Supervisor – 240 Hours	
17.0	Demonstrate winterizing skills. The student will be able to:
	17.01 Insulate exposed water pipes.
	17.02 Check backflow preventers on irrigation systems and hose bibbs.
	17.03 Drain and suction HVAC drain line.
	17.04 Change pump and pool timers for winter operation.

	17.05 Drain fountains as needed.
	17.06 Cover pools (and ponds) for winter months.
	17.07 Check door and window seals.
18.0	Demonstrate Heating, Ventilation and Air Conditioning (HVAC) rough in skills. The student will be able to:
	18.01 Explain heating and cooling principles and code requirements.
	18.02 Perform basic calculations for heating and cooling loads.
	18.03 Develop an understanding of building envelope, insulation, and ventilation.
	18.04 Select and discuss or install the components of an air conditioning system for a project including ductwork, coolant lines, compressor packages and coil packages.
	18.05 Identify and select refrigerants according to their properties.
	18.06 Repair registers and return grills.
	18.07 Install and exchange filtration media for HVAC systems.
	18.08 Install UV lights in HVAC systems.
19.0	Demonstrate finish HVAC skills. The student will be able to:
	19.01 Determine a refrigerant level.
	19.02 Install a control system for a project.
	19.03 Install registers for a project.
	19.04 Examine computer-monitoring systems associated with HVAC control systems and air-quality management.
	19.05 Troubleshoot and repair commercial ice machines.
	19.06 Perform refrigerant recovery in accordance with EPA guidelines/requirements.
20.0	Understand the building maintenance industry and related occupations. The student will be able to:
	20.01 Identify and distinguish trade occupations and the roles and responsibilities of each craft.
	20.02 Identify and distinguish maintenance project management occupations and the roles and responsibilities of each.
	20.03 Identify and differentiate design/engineering occupations, the relationship to maintenance and the roles and responsibilities of each.

	20.04 Understand the relationship between the Department of Labor and the maintenance industry, economy, and opportunity for employment.
21.0	Understand the natural environment and green built environment. The student will be able to:
	21.01 Recognize the development of the built environment and its impacts on the natural environment such as pollution, deforestation, climate change, health, and disease.
	21.02 Understand how a green built environment creates growth for the maintenance industry, and the economy such as health and safety, transportation, and natural resources.
	21.03 Understand the relationship between a green built environment and the natural environment.
	21.04 Understand the purpose of the United States Green Building Council (USGBC), the Green Building Certification Institute (GBCI) and Leadership for Energy and Environmental Design (LEED) and how they create sustainable growth for the maintenance industry and the economy.
	21.05 Discuss sustainable building design and its relationship between health (buildings and people) and energy efficiency.
	21.06 Understand the relationship between sustainable buildings and energy efficiency.
	21.07 Remember and understand renewable fuels and energy sources.
22.0	Understand laws and codes applicable to the building maintenance industry. The student will be able to:
	22.01 Discuss and remember the governmental law process at the federal, state, and local level and its impact on the maintenance industry and construction education.
	22.02 Understand the Codes of Federal Regulations (CFR) pertaining to the maintenance industry.
	22.03 Read and understand portions of the State of Florida Statues pertaining to the maintenance industry (Building Code).
	22.04 Discuss trade union and trade non-union workers - their effect and influence on health and safety, communication, transportation, and the economy.
	22.05 Discuss employment and training with union and non-union entities in the maintenance industry.
	22.06 Understand the role of apprenticeship in the maintenance industry and its impact on education.
	22.07 Discuss and understand the role of the Florida Department of Business and Professional Regulation.
	22.08 Discuss and understand the Construction Industry Licensing Board, its structure, polices and requirements related to maintenance.
	22.09 Discuss various maintenance occupations and explain the requirements for becoming licensed.
	22.10 Discuss the roles and responsibilities of the engineers, architects/designers, and the general contractor.
	22.11 Understand the roles and responsibilities of the general contractor, subcontractors, specialty contractors and employees of contractors when they are performing maintenance work.

	22.12 Identify and differentiate the roles and responsibilities of building maintenance firms and classifications of maintenance projects.
	22.13 Understand the process of establishing a business in the maintenance industry.
	22.14 Understand the relationship between the Department of Labor and maintenance projects.
	22.15 Understand the process of applying for building permits and variances for maintenance projects.
23.0	Understand maintenance agreements, drawings, documents, and specifications and how they apply. The student will be able to:
	23.01 Explain the purpose and components of contracts, drawings, plans, and specifications and explain their relation to building permits.
	23.02 Understand the importance of building codes and zoning regulations on the development of drawings and specifications.
	23.03 Understand the requirements for a “full set of drawings” including architectural (site plans, foundation plans, floor plans, interior/exterior elevations, sections, details, schedules, etc.), structural, plumbing, mechanical and electrical drawings.
	23.04 Understand building symbols, drawing lines, abbreviations, and scale in the development of blueprints.
	23.05 Prepare lists of materials and identify sources of specifications.
	23.06 Use architectural and engineering scales.
	23.07 Discuss the basic use of computer-aided design (CAD) software.
	23.08 Discuss contracts used in maintenance project: AIA, AGC, EJCDC, etc.
	23.09 Understand the 16 divisions of construction as defined by the Construction Specification Institute Master Format
	23.10 Understand the difference between permit required maintenance and repairs and those tasks that do not require a permit.
24.0	Understand elevator systems. The student will be able to:
	24.01 Determine if an elevator is performing properly; within manufacturer operating parameters.
	24.02 Repairing and replacing lights, mirrors, and finishes on the elevator cab interior.
25.0	Present a capstone project using skills learned throughout the program. The student will be able to:
	25.01 Solve design and maintenance problems to gain new perspectives.
	25.02 Apply critical-thinking and problem-solving skills used in design to develop solutions for real-life issues.
	25.03 Use and maintain tools and equipment used in the maintenance process.
	25.04 Work in a project team to develop cohesiveness, team building, respectful compromise, and time-management skills

25.05 Apply carpentry skills.
25.06 Apply masonry skills.
25.07 Apply Mechanical, Electrical and Plumbing (MEP) skills.
25.08 Apply maintenance industry safety.
25.09 Apply sustainable maintenance practices.
25.10 Apply learned and acquired skills to address maintenance industry standards, methods, and techniques.

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 co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Electricity**
Program Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

Career Certificate Program		
Program Number	I460312	
CIP Number	0646030202	
Grade Level	30,31	
Program Length	1200 Hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

The purpose of this program is to prepare students for employment or advanced training in a variety of electrical construction industries.

This program focuses on broad, transferable skills, stresses the understanding of all aspects of the electricity industry, and demonstrates such elements of the industry as planning, management, finance, technical and production skills, underlying principles of technology, labor issues, community issues, and health, safety, and environmental issues.

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.

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

Program Structure

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

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

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	BCV0603	Electrician Helper	ELECTRICAL @7 7G IND ENGR 7G TEC ED 1@2 ENG&TEC ED 1@2	300 Hours
B	BCV0640	Residential Electrician	ELECTRICAL @7 7G	450 Hours
C	BCV0652	Commercial Electrician		450 Hours

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Explain the importance of health, safety, environmental stewardship and related regulatory compliance.
02.0 Identify, use and maintain the tools and accessories used in the electrical industry.
03.0 Demonstrate an understanding of basic Direct-Current (DC) electrical-circuit skills.
04.0 Apply mathematics knowledge and skills to electricity.
05.0 Demonstrate an understanding of basic electricity.
06.0 Read and interpret basic electric codes.
07.0 Apply further mathematics knowledge and skills to electricity.
08.0 Demonstrate further understanding of electricity.
09.0 Demonstrate analytical and trouble shooting skills related to electrical principles.
10.0 Demonstrate proficiency in electrical math problems and skills.
11.0 Demonstrate an understanding of Alternating Current (AC) circuit skills.
12.0 Explain the importance of employability and entrepreneurship skills.
13.0 Install residential wiring.
14.0 Install residential wiring systems.
15.0 Demonstrate proficiency in commercial wiring.
16.0 Demonstrate specialized electrical skills.

Florida Department of Education
Student Performance Standards

Program Title: Electricity
Career Certificate Program Number: l460312

Course Number: BCV0603 **Occupational Completion Point: A** **Electrician Helper – 300 Hours**	
01.0	Explain the importance of health, safety, environmental stewardship and related regulatory compliance. The student will be able to:
01.01	Understand the role and purpose of the Occupational Safety and Health Administration (OSHA) rules and regulations.
01.02	Clean the work area and maintain it in a safe condition.
01.03	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.04	Identify and operate workplace safety electrical devices.
01.05	Identify health related problems that may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
01.06	Explain emergency procedures to follow in response to workplace accidents.
01.07	Create a disaster and/or emergency response plan for specific incidences.
01.08	Explain the importance of CPR (CardioPulmonary Resuscitation) and first aid.
01.09	Describe "Right-to-Understand" Law as recorded in (29 CFR.1910.1200).
02.0	Identify, use and maintain the tools and accessories used in the electrical industry. The student will be able to:
02.01	Identify and select tools, equipment and materials to complete a job.
02.02	Drill holes in metal, wood and concrete for electrical installations.
02.03	Determine the layout of electrical devices, complying with local, state and national electric code regulations.
02.04	Install the following, complying with the appropriate local, state or national electric codes: • Conductors and cable. • Standard outlets and switch boxes. • Cord connections on equipment. • Cords, switches, receptacles and dimmers, including a single-pole switched lighting circuit, a three-way switched lighting circuit and a four-way combination circuit.

03.0	Demonstrate an understanding of basic Direct Current (DC) electrical circuit skills. The student will be able to:
	03.01 Define the following terms: voltage, current, resistance and power.
	03.02 Measure voltage, current and resistance using industry standard electrical measuring devices.
	03.03 Analyze and explain series, parallel, and series parallel (combination) circuits.
	03.04 Draw each type of circuit and calculate the circuit values.
	03.05 Explain and apply Ohm's Law.
	03.06 Compute conductance and resistance of conductors.
04.0	Apply mathematics knowledge and skills to electricity. The student will be able to:
	04.01 Demonstrate knowledge of arithmetic operations.
	04.02 Analyze and apply data and measurements to solve problems and interpret documents.
	04.03 Construct charts, tables and graphs using functions and data.
05.0	Demonstrate an understanding of basic electricity. The student will be able to:
	05.01 Relate electricity to the nature of matter.
	05.02 Describe various ways that electricity is produced.
	05.03 Explain the magnetic properties of circuits and devices.
	05.04 Explain the principles of electromagnetism.
06.0	Read and interpret basic electric codes. The student will be able to:
	06.01 Describe the importance of following the local, state and national electric codes.
	06.02 Read and interpret basic electric codes, wiring plans and specifications.
	06.03 Identify licensure requirements for electrical occupations.
	06.04 Demonstrate knowledge of National Fire Protection Association (NFPA) 70E and how it relates to job safety.
07.0	Apply further mathematics knowledge and skills to electricity. The student will be able to:
	07.01 Demonstrate and solve basic algebraic formulas related to electricity.

	07.02 Solve basic trigonometric functions related to electrical theory.
	07.03 Explain basic Alternating Current (AC) theory and solve related mathematical problems using appropriate test equipment.
	07.04 Solve math related problems from measurements on training aids.
08.0	Demonstrate further understanding of electricity. The student will be able to:
	08.01 Explain how voltage is produced by chemical, mechanical, thermal, photoelectric and piezo electric means.
09.0	Demonstrate analytical and trouble shooting skills related to electrical principles. The student will be able to:
	09.01 Identify conditions and resolutions to overcurrent and ground fault conditions in electrical circuits.
	09.02 Discuss the dangers, conditions and resolutions to short circuit and arc fault conditions in electrical circuits.

Course Number: BCV0640 **Occupational Completion Point: B** **Residential Electrician – 450 Hours**	
10.0	Demonstrate proficiency in electrical math problems and skills. The student will be able to:
	10.01 Calculate wiring costs.
	10.02 Calculate voltage drop.
	10.03 Determine ampacity correction factors.
	10.04 Calculate conduit fill.
	10.05 Calculate box fill.
	10.06 Calculate range loads.
11.0	Demonstrate an understanding of Alternating Current (AC) circuit skills. The student will be able to:
	11.01 Identify the physical and electrical characteristics of capacitors and inductors.
	11.02 Demonstrate proficiency in measuring, testing and connecting a transformer.
	11.03 Analyze and apply the principles of transformers to AC circuits.
	11.04 Identify the properties of an AC signal. (optional)

	11.05 Identify AC sources.
12.0	Explain the importance of employability and entrepreneurship skills. The student will be able to:
	12.01 Identify and demonstrate positive work behaviors needed to be employable.
	12.02 Develop personal career plan that includes goals, objectives and strategies.
	12.03 Examine licensing, certification and industry credentialing requirements.
	12.04 Maintain a career portfolio to document knowledge, skills and experience.
	12.05 Evaluate and compare employment opportunities that match career goals.
	12.06 Identify and exhibit traits for retaining employment.
	12.07 Identify opportunities and describe requirements for career advancement.
	12.08 Describe the benefits of ongoing professional development.
	12.09 Examine and describe entrepreneurship opportunities as a career planning option.
13.0	Install residential wiring. The student will be able to:
	13.01 Identify residential wiring requirements and specifications in accordance with a wiring plan.
	13.02 Identify electrical symbols in construction documents.
	13.03 Draw a residential wiring plan, using electrical wiring symbols.
	13.04 Identify and install a recessed lighting fixture, a fluorescent lighting fixture and a surface lighting fixture according to the specifications, complying with the appropriate local, state and national electric codes.
	13.05 Identify, install and wire a duplex receptacle outlet circuit, a split wired duplex receptacle outlet circuit, and a special purpose receptacle outlet circuit, a Ground Fault Circuit Interrupter (GFCI) receptacle or circuit breaker, and an Arc Fault Circuit Interrupter (AFCI) receptacle or circuit breaker, according to the specifications, complying with the appropriate local, state and national electric codes.
14.0	Install residential wiring systems. The student will be able to:
	14.01 Install and wire a low voltage signal system.
	14.02 Install conduit systems.
	14.03 Provide power for Heating, Ventilation and Air Conditioning (HVAC) equipment.

14.04	Install the following, complying with the appropriate local, state and national electric codes: • Service entrance main panel. • Service entrance meter base. • Alarm systems and smoke detectors.
14.05	Demonstrate knowledge of the requirements for the installation of a swimming pool electrical system.
14.06	Connect single-phase and three-phase transformers.
14.07	Troubleshoot residential electric circuits.

Course Number: BCV0652 Occupational Completion Point: C Commercial Electrician – 450 Hours	
15.0	Demonstrate proficiency in commercial wiring. The student will be able to:
15.01	Read and interpret a commercial wiring plan and specifications.
15.02	Draw a commercial electrical wiring plan.
15.03	Select tools, equipment and materials to complete a job.
15.04	Install or identify the following according to the plan and specifications, complying with appropriate electric codes: • Wire mold. • Conduit, duct and raceway systems. • Conductors in a conduit.
15.05	Describe the difference between a residential and a commercial lighting circuit.
15.06	Describe poly-(three)-phase circuits.
15.07	Install a simple poly-(three)-phase circuit.
15.08	Construct control circuits from schematics.
15.09	Describe high voltage (over 1000 volts) wiring requirements.
15.10	Demonstrate a general knowledge of hazardous locations and wiring methods.
15.11	Explain a commercial three-phase receptacle circuit and an emergency lighting system.
15.12	Explain commercial service entrance requirements.
16.0	Demonstrate specialized electrical skills. The student will be able to:

16.01	Demonstrate an understanding of solid state control devices such as Variable Frequency Drives (VFD's), electronic ballast, electronic motor starters, motion sensors, etc.
16.02	Demonstrate an understanding of data cable installation according to the plans and specifications.
16.03	Demonstrate an understanding of the basic concepts of grounding and bonding.

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 co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Electrician**
Program Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

Career Certificate Program		
Program Number	I460314	
CIP Number	0646030204	
Grade Level	30,31	
Program Length	1500 Hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

The purpose of this program is to prepare students for employment or advanced training in a variety of electrical construction industries.

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 planning and installing electrical wiring, equipment, or fixtures based on job specifications and local codes.

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 four occupational completion points. The recommended sequence allows students to complete specified portions of a program for employment or to remain for advanced training. A student who completes the applicable competencies at any occupational completion point may either continue with the training program or terminate as an occupational completer.

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

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	BCV0603	Electrician Helper	ELECTRICAL @7 7G IND ENGR 7G TEC ED 1@2 ENG&TEC ED1@2	300 Hours
B	BCV0640	Residential Electrician	ELECTRICAL @7 7G	450 Hours
C	BCV0652	Commercial Electrician		450 Hours
D	BCV0667	Industrial Electrician		300 Hours

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Explain the importance of health, safety, environmental stewardship and related regulatory compliance.
02.0 Identify, use and maintain the tools and accessories used in the electrical industry.
03.0 Demonstrate an understanding of basic Direct-Current (DC) electrical-circuit skills.
04.0 Apply mathematics knowledge and skills to electricity.
05.0 Demonstrate an understanding of basic electricity.
06.0 Read and interpret basic electric codes.
07.0 Apply further mathematics knowledge and skills to electricity.
08.0 Demonstrate further understanding of electricity.
09.0 Demonstrate analytical and trouble shooting skills related to electrical principles.
10.0 Demonstrate proficiency in electrical math problems and skills.
11.0 Demonstrate an understanding of Alternating Current (AC) circuit skills.
12.0 Explain the importance of employability and entrepreneurship skills.
13.0 Install residential wiring.
14.0 Install residential wiring systems.
15.0 Demonstrate proficiency in commercial wiring.
16.0 Demonstrate specialized electrical skills.
17.0 Demonstrate competency in industrial wiring.
18.0 Demonstrate competency in Alternating Current (AC) and Direct Current (DC) motors.
19.0 Demonstrate competency in electrical and electronic control circuits and equipment.

Florida Department of Education
Student Performance Standards

Program Title: Electrician
Career Certificate Program Number: I460314

Course Number: BCV0603 **Occupational Completion Point: A** **Electrician Helper – 300 Hours**	
01.0	Explain the importance of health, safety, environmental stewardship and related regulatory compliance. The student will be able to:
01.01	Understand the role and purpose of the Occupational Safety and Health Administration (OSHA) rules and regulations.
01.02	Clean the work area and maintain it in a safe condition.
01.03	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.04	Identify and operate workplace safety electrical devices.
01.05	Identify health related problems that may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
01.06	Explain emergency procedures to follow in response to workplace accidents.
01.07	Create a disaster and/or emergency response plan for specific incidences.
01.08	Explain the importance of CPR (cardiopulmonary resuscitation) and first aid.
01.09	Describe "Right-to- Understand" Law as recorded in (29 CFR.1910.1200).
02.0	Identify, use and maintain the tools and accessories used in the electrical industry. The student will be able to:
02.01	Identify and select tools, equipment and materials to complete a job.
02.02	Drill holes in metal, wood and concrete for electrical installations.
02.03	Determine the layout of electrical devices, complying with local, state and national electric code regulations.
02.04	Install the following, complying with the appropriate local, state or national electric codes: • Conductors and cable • Standard outlets and switch boxes • Cord connections on equipment • Cords, switches, receptacles and dimmers, including a single-pole switched lighting circuit, a three-way switched lighting circuit and a four-way combination circuit

03.0	Demonstrate an understanding of basic Direct-Current (DC) electrical-circuit skills. The student will be able to:
	03.01 Define the following terms: voltage, current, resistance and power.
	03.02 Measure voltage, amperage and resistance using industry standard electrical measuring devices.
	03.03 Analyze and explain series, parallel, and series parallel (combination) circuits.
	03.04 Draw each type of circuit and calculate the circuit values.
	03.05 Explain and apply Ohm's Law.
	03.06 Compute conductance and resistance of conductors.
04.0	Apply mathematics knowledge and skills to electricity. The student will be able to:
	04.01 Demonstrate knowledge of arithmetic operations.
	04.02 Analyze and apply data and measurements to solve problems and interpret documents.
	04.03 Construct charts, tables and graphs using functions and data.
05.0	Demonstrate an understanding of basic electricity. The student will be able to:
	05.01 Relate electricity to the nature of matter.
	05.02 Describe various ways that electricity is produced.
	05.03 Explain the magnetic properties of circuits and devices.
	05.04 Explain the principles of electromagnetism.
06.0	Read and interpret basic electric codes. The student will be able to:
	06.01 Describe the importance of following the local, state and national electric codes.
	06.02 Read and interpret basic electric codes, wiring plans and specifications.
	06.03 Identify licensure requirements for electrical occupations.
	06.04 Demonstrate knowledge of National Fire Protection Association (NFPA) 70E and how it relates to job safety.
07.0	Apply further mathematics knowledge and skills to electricity. The student will be able to:
	07.01 Demonstrate and solve basic algebraic formulas related to electricity.

	07.02 Solve basic trigonometric functions related to electrical theory.
	07.03 Explain basic Alternating Current (AC) theory and solve related mathematical problems using appropriate test equipment.
	07.04 Solve math related problems from measurements on training aids.
08.0	Demonstrate further understanding of electricity. The student will be able to:
	08.01 Explain how voltage is produced by chemical, mechanical, thermal, photoelectric and piezo electric means.
09.0	Demonstrate analytical and trouble shooting skills related to electrical principles. The student will be able to:
	09.01 Identify conditions and resolutions to overcurrent and ground fault conditions in electrical circuits.
	09.02 Discuss the dangers, conditions and resolutions to short circuit and arc fault conditions in electrical circuits.

Course Number: BCV0640 **Occupational Completion Point: B** **Residential Electrician – 450 Hours**	
10.0	Demonstrate proficiency in electrical math problems and skills. The student will be able to:
	10.01 Calculate wiring costs.
	10.02 Calculate voltage drop.
	10.03 Determine ampacity correction factors.
	10.04 Calculate conduit fill.
	10.05 Calculate box fill.
	10.06 Calculate range loads.
11.0	Demonstrate an understanding of Alternating Current (AC) circuit skills. The student will be able to:
	11.01 Identify the physical and electrical characteristics of capacitors and inductors.
	11.02 Demonstrate proficiency in measuring, testing and connecting a transformer.
	11.03 Analyze and apply the principles of transformers to AC circuits.
	11.04 Identify the properties of an AC signal. (optional)

	11.05 Identify AC sources.
12.0	Explain the importance of employability and entrepreneurship skills. The student will be able to:
	12.01 Identify and demonstrate positive work behaviors needed to be employable.
	12.02 Develop personal career plan that includes goals, objectives and strategies.
	12.03 Examine licensing, certification and industry credentialing requirements.
	12.04 Maintain a career portfolio to document knowledge, skills and experience.
	12.05 Evaluate and compare employment opportunities that match career goals.
	12.06 Identify and exhibit traits for retaining employment.
	12.07 Identify opportunities and describe requirements for career advancement.
	12.08 Describe the benefits of ongoing professional development.
	12.09 Examine and describe entrepreneurship opportunities as a career planning option.
13.0	Install residential wiring. The student will be able to:
	13.01 Identify residential-wiring requirements and specifications in accordance with a wiring plan.
	13.02 Identify electrical symbols in construction documents.
	13.03 Draw a residential wiring plan, using electrical wiring symbols.
	13.04 Identify and install a recessed lighting fixture, a fluorescent lighting fixture and a surface lighting fixture according to the specifications, complying with the appropriate local, state and national electric codes.
	13.05 Identify, install and wire a duplex receptacle outlet circuit, a split circuit duplex receptacle outlet circuit, and a special purpose receptacle outlet circuit, a Ground Fault Circuit Interrupter (GFCI) receptacle or circuit, and an Arc Fault Circuit Interrupter (AFCI) receptacle or circuit, according to the specifications, complying with the appropriate local, state and national electric codes.
14.0	Install residential wiring systems. The student will be able to:
	14.01 Install and wire a low voltage signal system.
	14.02 Install conduit systems.
	14.03 Provide power for Heating, Ventilation and Air Conditioning (HVAC) equipment.
	14.04 Install the following, complying with the appropriate local, state and national electric codes: • Service entrance main panel.

	• Service entrance meter base. • Alarm systems and smoke detectors.
14.05	Demonstrate knowledge of the requirements for the installation of a swimming pool electrical system.
14.06	Connect single-phase and three-phase transformers.
14.07	Troubleshoot residential electric circuits.

Course Number: BCV0652 Occupational Completion Point: C Commercial Electrician – 450 Hours	
15.0	Demonstrate proficiency in commercial wiring. The student will be able to:
15.01	Read and interpret a commercial wiring plan and specifications.
15.02	Draw a commercial electrical wiring plan.
15.03	Select tools, equipment and materials to complete a job.
15.04	Install or identify the following according to the plan and specifications, complying with appropriate electric codes: • Wire mold. • Conduit, duct and raceway systems. • Conductors in a conduit.
15.05	Describe the difference between a residential and a commercial lighting circuit.
15.06	Describe poly-(three)-phase circuits.
15.07	Install a simple poly-(three)-phase circuit.
15.08	Construct control circuits from schematics.
15.09	Describe high voltage (over 1000 volts) wiring requirements.
15.10	Demonstrate a general knowledge of hazardous locations and wiring methods.
15.11	Explain a commercial three-phase receptacle circuit and an emergency lighting system.
15.12	Explain commercial service entrance requirements.
16.0	Demonstrate specialized electrical skills. The student will be able to:
16.01	Demonstrate an understanding of solid state control devices such as Variable Frequency Drives (VFD's), electronic ballast, electronic motor starters, motion sensors, etc.

16.02	Demonstrate an understanding of data cable installation according to the plans and specifications.
16.03	Demonstrate an understanding of the basic concepts of grounding and bonding.

Course Number: BCV0667 **Occupational Completion Point: D** **Industrial Electrician – 300 Hours**	
17.0	Demonstrate competency in industrial wiring. The student will be able to:
17.01	Draw an industrial one line power diagram.
17.02	Test insulation resistance using a megohmmeter.
17.03	Install a motor branch circuit.
17.04	Using the National Electrical Code (NEC), make the following required calculations: • Conductor size • Overcurrent protection • Overload protection • Short circuit protection
17.05	Install a 277 volt lighting branch circuit.
17.06	Describe a bus duct power distribution system.
17.07	Describe fiber optic installation requirements.
17.08	Demonstrate the use of industrial test equipment.
17.09	Install the following: • Disconnect switch, fused and unfused • Raceways • Emergency stop switch • Circuit breaker • Panel board
17.10	Explain the basic principles of mutual induction and transformer action.
17.11	Explain the operation and use of a current transformer.
17.12	Explain the operation and use of a potential transformer.
17.13	Explain the operation and use of a buck boost transformer and when it is used.

	17.14 Explain and connect three-phase transformers in both delta and wye configuration.
	17.15 Calculate the over current protection requirements for the primary and secondary.
	17.16 Explain what transformer impedance is and its importance.
18.0	Demonstrate competency in Alternating Current (AC) and Direct Current (DC) motors. The student will be able to:
	18.01 Install and connect the following types of DC motors: • Series • Shunt • Compound
	18.02 Install and connect the following types of single-phase AC motors: • Capacitor start • Capacitor start and run • Split-phase inductor • Universal • Repulsion start, induction run
	18.03 Install and connect the following types of three-phase AC motors: • Squirrel cage induction • Wound rotor • Synchronous
	18.04 Select and connect a three-phase induction motor for either high or low voltage requirements.
19.0	Demonstrate competency in electrical and electronic control circuits and equipment. The student will be able to:
	19.01 Draw an elementary motor control ladder diagram.
	19.02 Interpret symbols, read and troubleshoot from schematics and ladder diagrams.
	19.03 Describe the operation of the following overload relays: • Thermal • Magnetic • Thermal magnetic
	19.04 Install a manual single-phase and three-phase control station.
	19.05 Install a three-phase magnetic starter.
	19.06 Install the following control devices: • Start/stop station • Forward/reverse/stop station

- Hands/off/auto station
- Start/jog/stop station
- Limit switches
- Pressure, temperature, level and float switches
- Pilot, run and stop indicator lights
- Control relay and timing relays
- Multi-motor push button station

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 co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Building Construction Technologies**
Program Type: **Career Preparatory**
Career Cluster: **Architecture & Construction**

Career Certificate Program		
Program Number	I460401	
CIP Number	0646041502	
Grade Level	30, 31	
Program Length	1050 Hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

The purpose of this program is to prepare students for employment or advanced training in the building construction industry.

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 & 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 & Construction career cluster.

The content includes but is not limited to developing skills in various construction trades, as well as providing a foundation in construction management.

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

Program Structure

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

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

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	BCV0400	Building Construction Helper	AC HEAT ME @7 7G BLDG CONST @7 7G BLDG MAINT @7 7G CARPENTRY @7 7G DRAFTING @7 7G ELECTRICAL @7 7G ENG 7G PLUMBIN @7 7G SHEETMETAL @7 7G TEC CONSTR @7 7G TEC DRAFT 7G TROWEL TR 7G	450 Hours
B	BCV0401	Building Construction Technician 1		300 Hours
	BCV0402	Building Construction Technician 2		300 Hours

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
02.0 Investigate the construction industry and explore related occupations.
03.0 Select and use basic hand tools.
04.0 Select and use power tools and describe their proper operation.
05.0 Demonstrate mathematics knowledge and skills.
06.0 Read and interpret construction drawings.
07.0 Frame floor systems based on drawing and specification requirements.
08.0 Frame walls and ceilings based on drawing and specification requirements.
09.0 Frame a roof based on drawing and specification requirements.
10.0 Analyze construction components, materials, hardware and characteristics.
11.0 Demonstrate masonry skills.
12.0 Erect, plumb and brace a simple concrete form with reinforcement.
13.0 Place concrete.
14.0 Demonstrate welding knowledge and skills (Optional).
15.0 Understand construction documents, contract documents and specifications.
16.0 Select the appropriate heavy equipment for a given task. (Optional)
17.0 Identify local, state and federal codes and regulations.
18.0 Perform site preparation and maintenance.
19.0 Estimate project costs and schedule construction activities for a specific job.
20.0 Investigate sustainability issues related to the design, construction and maintenance of the built environment.
21.0 Complete a construction project using skills learned in the program.
22.0 Install roofing materials.
23.0 Install exterior finishes.
24.0 Explain the importance of employability and entrepreneurship skills.
25.0 Demonstrate interior carpentry skill.
26.0 Install cabinets.
27.0 Prepare and apply finishes to surfaces.
28.0 Build stairs.
29.0 Troubleshoot, repair and install plumbing systems.
30.0 Demonstrate knowledge of Drain, Waste and Vent (DWV) systems.
31.0 Measure, cut and join plastic piping.
32.0 Properly measure, ream, cut and join copper piping.
33.0 Demonstrate electrical safety.
34.0 Troubleshoot, repair and install electrical systems.
35.0 Research the Heating, Ventilation and Air-Conditioning (HVAC) profession.
36.0 Maintain, repair and install HVAC systems.

Florida Department of Education
Student Performance Standards

Program Title: **Building Construction Technologies**
Career Certificate Program Number: **l460401**

Course Number: BCV0400 **Occupational Completion Point: A** **Building Construction Helper – 450 Hours**	
01.0	Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
01.01	Understand the role and the purpose of the Occupational Safety and Health Administration (OSHA) rules and regulations.
01.02	Identify and locate Safety Data Sheets (formerly called Material Safety Data Sheets (MSDS)) and follow the procedures as necessary.
01.03	While using a safety data sheet, identify health-related problems that may result from exposure to work-related chemicals and hazardous materials, and demonstrate knowledge of the proper precautions required for handling such materials.
01.04	Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200)
01.05	Identify and use safety equipment and personal protective equipment (PPE).
01.06	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.07	Explain emergency procedures to follow in response to workplace accidents.
02.0	Investigate the construction industry and explore related occupations. The student will be able to:
02.01	Demonstrate an understanding of the relationship between construction and the environment.
02.02	Describe the role of trade unions in the construction industry.
02.03	Research apprenticeship opportunities.
02.04	Identify the different classifications of construction projects.
02.05	Define the roles and responsibilities of the general contractor, specialty contractor, construction management and design build firms.
02.06	Research construction trade occupations and the roles and responsibilities of each craft.
02.07	Research construction management occupations and the roles and responsibilities of each.
02.08	Identify design and engineering occupations and the roles and responsibilities of each.

	02.09 Describe the process of applying for building permits and variances.
	02.10 Explain the importance of zoning requirements.
03.0	Select and use basic hand tools. The student will be able to:
	03.01 Identify, select and use appropriate hammers used in the construction industry.
	03.02 Identify, use and select saws to cut material.
	03.03 Identify and use various common screwdriver types.
	03.04 Select and use various types of non-adjustable wrenches, adjustable wrenches and plumbing tools, chisels and punches, pliers, ripping bars and nail pullers, woodworking files, spirit levels, socket wrench sets, hand or block sanders, carpenters' squares, utility knives, clamps and shovels.
04.0	Select and use power tools and describe their proper operation. The student will be able to:
	04.01 Identify power tools including sanders, drills, circular saws, jig saws, reciprocating saws, radial-arm saws, table saws, band saws (optional), miter saws, drill presses (Optional), grinders, electric routers and pneumatic nailers.
	04.02 Identify and use various types of drill bits.
	04.03 Describe the proper operation of power tools and equipment.
05.0	Demonstrate mathematics knowledge and skills. The student will be able to:
	05.01 Solve job-related problems by adding, subtracting, multiplying and dividing numbers, using fractions, decimals and whole numbers.
	05.02 Change numbers to percentages.
	05.03 Demonstrate knowledge of arithmetic operations.
	05.04 Read a ruler and a tape measure.
	05.05 Compute feet, inches and yards.
	05.06 Change hours and minutes to decimals (Optional), fractions and mixed numbers.
	05.07 Analyze and apply data and measurements to solve problems and interpret documents.
	05.08 Determine ratios and proportions.
	05.09 Convert decimals to fractions and fractions to decimals.
	05.10 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares and cylinders.

06.0	Read and interpret construction drawings. The student will be able to:
	06.01 Identify basic construction drawing terms, components and symbols, and where to locate these on the drawings.
	06.02 Locate sections, elevations and details to their location on the plan view.
	06.03 Use drawing dimensions to lay out a construction project.
	06.04 Interpret and use architectural scales.
07.0	Frame floor systems based on drawing and specification requirements. The student will be able to:
	07.01 Identify floor and sill framing and support members.
	07.02 Name the methods used to fasten sills to the foundation.
	07.03 Understand how girder/beam and joist sizes are selected.
	07.04 Identify different types of floor joists.
	07.05 Identify different types of bridging.
	07.06 Identify different types of flooring materials.
	07.07 Explain the purposes of subflooring and underlayment.
	07.08 Match selected fasteners used in floor framing to their correct uses.
	07.09 Estimate the amount of material needed to frame a floor assembly.
	07.10 Demonstrate the ability to:
	• Lay out and construct a floor assembly
	• Install bridging (wood cross bridging, solid wood bridging and steel cross bridging).
	• Install joists for a cantilever floor.
	• Install a subfloor using butt-joint plywood/OSB panels and structural panels.
	• Install a single floor system using tongue-and-groove plywood/OSB panels.
08.0	Frame walls and ceilings based on drawing and specification requirements. The student will be able to:
	08.01 Identify the components of a wall and ceiling layout.

	08.02 Lay out a wood frame wall, including plates, corner posts, door and window openings, partition T's, bracing and the use of fire stops where applicable.
	08.03 Identify the common materials and methods used for installing sheathing on walls.
	08.04 Demonstrate the ability to dry in a structure (i.e., Building wrap, paper, taping, etc.).
	08.05 Lay out, assemble, erect and brace exterior walls for a frame building.
	08.06 Describe wall framing techniques used in masonry construction.
	08.07 Explain or demonstrate the use of metal studs in wall framing.
	08.08 Layout, cut and install ceiling joists on a wood frame building.
	08.09 Estimate the materials required to frame walls and ceilings.
09.0	Frame a roof based on drawing and specification requirements. The student will be able to:
	09.01 Understand the terms associated with roof framing.
	09.02 Identify the roof framing members used in gable and hip roofs.
	09.03 Calculate the length of a rafter using various methods.
	09.04 Identify the various types of trusses used in roof framing.
	09.05 Use a rafter framing square, speed square and calculator in laying out a roof.
	09.06 Identify various types of sheathing used in roof construction.
	09.07 Frame a gable roof with vent openings.
	09.08 Frame a roof opening.
	09.09 Erect a gable roof using trusses.
	09.10 Estimate the materials used in framing and sheathing a roof.
10.0	Analyze construction components, materials, hardware and characteristics. The student will be able to:
	10.01 Identify the components of various kinds of structures including slabs and foundations, interior and exterior walls, roofs and flooring systems.
	10.02 Identify the types of wall sections.

	10.03 Identify the types and installation procedures of roof, wall and floor sheathing.
	10.04 Identify various roof supports.
11.0	Demonstrate masonry skills. The student will be able to:
	11.01 Describe the most common types of masonry units.
	11.02 Describe how to set up and plumb a wall.
	11.03 Describe the transformation pattern (i.e., different brick pattern, floor tile, plywood on floor, vinyl siding, etc.).
	11.04 Lay a dry bond.
	11.05 Spread and furrow a bed joint and butter masonry units.
	11.06 Describe the different types of masonry bonds.
	11.07 Cut brick and block accurately.
	11.08 Select the tools and equipment used for mixing mortar.
	11.09 Describe the factors that affect the consistency of mortar.
	11.10 Identify the common ratios (M, N, S and O) of mortar mixtures.
	11.11 Identify pointing tools and strike mortar joints.
	11.12 Repoint old work.
	11.13 Prepare a work area, protecting adjacent areas.
	11.14 Use various methods of putting up the line.
	11.15 Identify and use the various types of trowels.
	11.16 Identify and use the various types of caulking and application.
	11.17 Demonstrate the procedures for stucco application and repair.
	11.18 Mix various types of stucco.
	11.19 Identify, select, use and maintain tools, materials and equipment used in masonry.
	11.20 Use safe and proper procedures for cleaning equipment, materials, work areas and worker.

12.0	Erect, plumb and brace a simple concrete form with reinforcement. The student will be able to:
	12.01 Identify the properties of cement.
	12.02 Understand the various types of concrete, considering application and Pounds per Square Inch (PSI) strength.
	12.03 Describe the composition of concrete.
	12.04 Perform volume estimates for concrete quantity requirements.
	12.05 Identify types of concrete reinforcement materials and describe their uses.
	12.06 Identify various types of footings and explain their uses.
	12.07 Identify the parts of various types of forms.
	12.08 Construct various types of concrete forms.
	12.09 Describe in-beds used in concrete formwork.
	12.10 Identify appropriate form stripping and handling techniques.
	12.11 Explain the safety procedures associated with the construction and use of concrete forms.
13.0	Place concrete. The student will be able to:
	13.01 Describe how to slump test concrete before placement.
	13.02 Identify equipment used to transport and place concrete.
	13.03 Identify, select and use concrete tools.
	13.04 Place and consolidate concrete into forms.
	13.05 Strike off and level concrete using a screed.
	13.06 Use tools to place, float and finish concrete.
	13.07 Determine when conditions permit the concrete finishing operation to start.
	13.08 Name the factors that affect the curing of concrete and describe the methods used to achieve proper curing.
14.0	Demonstrate welding knowledge and skills. (Optional) The student will be able to:
	14.01 Identify welding and cutting hazards and how to avoid or minimize them in the workplace.

	14.02 Identify and demonstrate the proper use of cutting and welding equipment [e.g., Oxy-Fuel, Plasma Arc, Shielded Metal Arc Welding (SMAW), Gas-Metal Arc Welding (GMAW), Gas-Tungsten Arc Welding (GTAW)].
15.0	Understand construction documents, contract documents and specifications. The student will be able to:
	15.01 Explain the purpose and components of contract documents and specifications.
	15.02 Read, interpret and apply plans, elevations, sections and details.
	15.03 Explain the relationships of the elements of contract documents.
	15.04 Create lists of materials and prepare estimates.
	15.05 Use architectural and engineering scales.
	15.06 Compare various Computer-Aided Drafting (CAD) and Building Information Modeling (BIM) products and how they can be used by designers and construction project managers. (optional)
	15.07 Compare and analyze traditional drafting with CAD and BIM systems. (Optional)
	15.08 Identify and use technology and other resources to assist with design decisions.
16.0	Select the appropriate heavy equipment for a given task. (Optional) The student will be able to:
	16.01 Identify different types and uses of heavy equipment.
	16.02 Describe the operations of different types of heavy equipment.
17.0	Identify local, state and federal codes and regulations. The student will be able to:
	17.01 Identify and locate local, state and federal codes, regulations and standards.
	17.02 Identify local, state and federal regulatory agencies.
18.0	Perform site preparation and maintenance. The student will be able to:
	18.01 Understand zoning requirements.
	18.02 Understand property lines and building setbacks.
	18.03 Understand grades and elevations.
	18.04 Understand the need to add, remove or relocate fill to proper compaction.
	18.05 Lay out and mark building locations and elevations.

	18.06 Clean and maintain the site.
19.0	Estimate project costs and schedule construction activities for a specific job. The student will be able to:
	19.01 Calculate material quantities and purchase cost (including sales tax).
	19.02 Calculate labor costs including work hours, duration and cost of workers.
	19.03 Explain and compute federal, state and local taxes.
	19.04 Schedule various construction activities (i.e., timeframes, workers & special equipment).
20.0	Investigate sustainability issues related to the design, construction and maintenance of the built environment. The student will be able to:
	20.01 Describe the impact of the construction industry on the natural environment.
	20.02 Recommend sustainable alternatives to conventional construction practices.
	20.03 Identify specific practices that can lessen adverse impacts on the environment.
	20.04 Understand holistic green and LEED (Leadership in Energy and Environmental Design) construction.
21.0	Complete a construction project using skills learned in the program. The student will be able to:
	21.01 Create a 3-dimensional representational or abstract model.
	21.02 Demonstrate imaginative or innovative solutions for a design project.
	21.03 Develop competence and dexterity through practice in the use of processes, tools and techniques.
	21.04 Apply critical-thinking and problem solving skills used in design and construction to develop solutions for real-life issues.
	21.05 Use and maintain tools and equipment to facilitate the design and construction process.
	21.06 Work in a project team to show cohesiveness, team building, respectful compromise and time-management skills.

Course Number: BCV0401 **Occupational Completion Point:** **Building Construction Technician 1 – 300 Hours**	
22.0	Install roofing materials. The student will be able to:
	22.01 Identify and explain different types of roofing systems and applications.

	22.02 Install various types of shingles.
	22.03 Install roof gutters and downspouts.
	22.04 Seal pipes and vents on roofs.
	22.05 Identify installation procedures for sheet metal roofs, built-up roofs and roof flashing.
23.0	Install exterior finishes. The student will be able to:
	24.01 Describe the purpose of wall insulation and flashing.
	24.02 Install common cornices.
	24.03 Estimate lap and panel siding.
	24.04 Describe the types and applications of various types of siding (i.e., wood, fiber-cement, vinyl, metal, stucco, masonry, etc.).
	24.05 Install siding.
24.0	Explain the importance of employability and entrepreneurship skills. The student will be able to:
	24.01 Identify and demonstrate positive work behaviors needed to be employable.
	24.02 Develop personal career plan that includes goals, objectives and strategies.
	24.03 Examine licensing, certification and industry credentialing requirements.
	24.04 Maintain a career portfolio to document knowledge, skills and experience.
	24.05 Evaluate and compare employment opportunities that match career goals.
	24.06 Identify and exhibit traits for retaining employment.
	24.07 Identify opportunities and research requirements for career advancement.
	24.08 Research the benefits of ongoing professional development.
	24.09 Examine and describe entrepreneurship opportunities as a career planning option.
25.0	Demonstrate interior carpentry skill. The student will be able to:
	25.01 Install interior finish materials (i.e., wood trim, drywall, floor/wall tile, acoustic tile, etc.).
	25.02 Install and trim exterior and interior doors and windows.

26.0	Install cabinets. The student will be able to:
	26.01 Identify the parts of a cabinet.
	26.02 Identify the types of cabinet door installation.
	26.03 Identify the types of cabinet hardware.
	26.04 Install cabinets and hardware.
27.0	Prepare and apply finishes to surfaces. The student will be able to:
	27.01 Erect an extension ladder and a scaffold.
	27.02 Prepare the surfaces.
	27.03 Apply finished coatings to surfaces with a roller, brush and sprayer.
28.0	Build stairs. The student will be able to:
	28.01 Identify various types and parts of stairs.
	28.02 Identify materials used in the construction of stairs.
	28.03 Interpret construction drawings of stairs.
	28.04 Calculate the total rise, the number and size of the risers and treads required for a stairway.
	28.05 Lay out and cut stringers, risers and treads.
Course Number: BCV0402 **Occupational Completion Point: B** **Building Construction Technician 2 – 300 Hours**	
29.0	Troubleshoot, repair and install plumbing systems. The student will be able to:
	29.01 Troubleshoot, repair and install bathroom fixtures and hardware such as lavatories, water closets, urinals, showers, bathtubs, traps and Drain, Waste and Vent (DWV) systems.
	29.02 Troubleshoot, repair and install kitchen fixtures and hardware, such as sinks, garbage disposals, faucets and hot water heaters.
	29.03 Identify and install various pipes and tubing used in the plumbing trade.
	29.04 Test and inspect plumbing systems.

30.0	Demonstrate knowledge of Drain, Waste and Vent (DWV) systems. The student will be able to:
	30.01 Explain how waste moves from a fixture through the drain system to the environment.
	30.02 Identify the major components of a drainage system and describe their functions.
	30.03 Identify the different types of traps and their components.
	30.04 Explain the importance of traps and identify the ways that traps can lose their seals.
	30.05 Identify the various types of DWV fittings and describe their applications.
	30.06 Identify significant code and health issues, violations and consequences related to DWV systems.
31.0	Measure, cut and join plastic piping. The student will be able to:
	31.01 Identify types of materials and schedules of plastic piping.
	31.02 Identify proper and improper applications of plastic piping.
	31.03 Identify types of fittings and valves used with plastic piping.
	31.04 Identify and determine the kinds of hangers and supports needed for plastic piping.
	31.05 Identify the various techniques used in hanging and supporting plastic piping.
	31.06 Explain proper procedures for the handling, storage and protection of plastic pipes.
32.0	Properly measure, ream, cut and join copper piping. The student will be able to:
	32.01 Identify the types of materials and schedules used with copper piping.
	32.02 Identify the material properties, storage and handling requirements of copper piping.
	32.03 Identify the types of fittings and valves used with copper piping.
	32.04 Identify and demonstrate the techniques used in hanging and supporting copper piping.
	32.05 Identify the hazards and safety precautions associated with copper piping.
33.0	Demonstrate electrical safety. The student will be able to:
	33.01 Identify electrical hazards and how to avoid or minimize them in the workplace.
	33.02 Explain safety issues concerning lockout/tag-out procedures, confined space entry, respiratory protection and fall protection systems.

	33.03 Develop a task plan and hazard assessment for a given task and select the appropriate Personal Protective Equipment (PPE) and work methods.
	33.04 Explain the role of the National Electric Code.
34.0	Troubleshoot, repair and install electrical systems. The student will be able to:
	34.01 Explain basic electrical theory.
	34.02 Explain branch circuit systems.
	34.03 Identify and explain service-entrance equipment.
	34.04 Identify and explain Ground Fault Circuit Interrupter (GFCI) circuitry.
	34.05 Troubleshoot electrical systems, using testing and metering devices.
	34.06 Install electrical outlets, switches and light fixtures.
	34.07 Install and replace breakers (and fuses, if applicable - optional).
	34.08 Identify types of wiring raceways.
	34.09 Test and inspect electrical systems.
	34.10 Identify alternative energy sources (i.e., solar, wind, mechanical, thermal, etc.).
35.0	Research the Heating, Ventilation and Air-Conditioning (HVAC) profession. The student will be able to:
	35.01 Explain what the Clean Air Act means to the HVAC profession.
	35.02 Describe regulatory codes relevant to the HVAC industry.
36.0	Maintain, repair and install HVAC systems. The student will be able to:
	36.01 Explain heating and cooling principles and code requirements.
	36.02 Describe various methods of calculating heating and cooling loads.
	36.03 Explain the operation and types of the following heating methods: water, steam, forced air, gas, electrical components and heat pumps and associated electrical components.
	36.04 Identify refrigerants.
	36.05 Identify and replace air filters and maintain drain systems.

36.06 Explain how to troubleshoot, repair and replace control systems.

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Industrial Pipefitter**
Program Type: **Career Preparatory**
Career Cluster: **Architecture & Construction**

Career Certificate Program		
Program Number	I460514	
CIP Number	0646050200	
Grade Level	30, 31	
Program Length	600 Hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

The purpose of the program is to prepare students for employment in a variety of industrial pipefitting occupations.

This program focuses on broad, transferable skills, stresses understanding of the pipe fitting industry, and demonstrates elements of the Pipe Fitting Trades industry; such as planning, management, finance, technical and production skills, underlying principles of technology, labor issues, community issues and health, safety, and environmental issues.

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 & 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 & Construction career cluster.

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

Program Structure

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

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

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	BCV0568	Industrial Pipefitter Helper	PLUMBING @7 7G BLDG CONST ¶ 7 ¶G TECH CONSTR ¶ 7 ¶G WELDING @7 7G	300 Hours
B	BCV0569	Industrial Pipefitter		300 Hours

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Apply safety rules and procedures.
02.0 Apply proper use and care of hand tools.
03.0 Apply proper use and care of power tools.
04.0 Accomplish threaded pipe fabrications.
05.0 Apply proper use and care of ladders and scaffolds.
06.0 Apply proper use and care of motorized equipment.
07.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
08.0 Identify and explain excavations.
09.0 Identify and explain underground pipe.
10.0 Identify and explain intermediate excavations.
11.0 Perform underground pipe installation.
12.0 Understand drawings and detail sheets.
13.0 Identify and explain piping systems.
14.0 Use pipefitter trade math.
15.0 Identify and explain socket weld pipe fabrication.
16.0 Identify and explain butt weld pipe fabrication.
17.0 Identify, select, use and maintain rigging.
18.0 Identify and use pipe hangers and supports.
19.0 Read advanced blue print.
20.0 Read, interpret pipefitting standards and specifications.
21.0 Use, explain, perform and calculate advanced trade math.
22.0 Identify, explain, and use motorized equipment.
23.0 Accomplish above ground pipe installation.
24.0 Identify and install valves.
25.0 Field route and accomplish vessel trim.
26.0 Identify, explain, select, and install spring can supports.
27.0 Test piping systems and equipment.
28.0 Accomplish basic plumbing.
29.0 Plan work activities.
30.0 Accomplish advanced pipe fabrication.
31.0 Perform NDE testing.
32.0 Accomplish stress-relieving and aligning.
33.0 Identify and use steam traps.
34.0 Identify and use inline components.
35.0 Use and fabricate special piping.

36.0 Accomplish hot taps.
37.0 Maintain valves.

Florida Department of Education
Student Performance Standards

Program Title: **Industrial Pipefitter**
Career Certificate Program Number: **I460514**

Course Number: BCV0568 **Occupational Completion Point: A** **Industrial Pipefitter Helper – 300 Hours**	
01.0	Apply safety rules and procedures. The student will be able to:
01.01	Practice shop safety rules and procedures.
01.02	Practice personal safety rules and procedures.
01.03	Practice fire safety rules and procedures.
01.04	Practice electrical safety rules and procedures.
01.05	Practice tool safety rules and procedures.
01.06	Practice ladder and scaffolding safety rules and procedures.
01.07	Practice maintaining a clean work and shop area.
01.08	Perform tag lockout procedures
01.09	Identify Occupational Safety and Health Administration (OSHA) requirements and procedures.
01.10	Locate and use Materials Safety Data Sheets (MSDS).
02.0	Apply proper use and care of hand tools. The student will be able to:
02.01	Explain general hand tool safety.
02.02	Use and care for pipefitter vises and stands.
02.03	Use and care for pipe wrenches.
02.04	Use and care for levels.
02.05	Use and care for pipe fabrication tools.
02.06	Use and care for pipe cutting tools.

	02.07 Use and care for benders and flaring tools.
03.0	Apply proper use and care of power tools. The student will be able to:
	03.01 Explain and perform power tool safety.
	03.02 Cut pipe using a portable band saw.
	03.03 Identify and explain types of portable grinders.
	03.04 Use and care for portable grinders.
	03.05 Identify and explain pipe-threading machines.
	03.06 Use and care for pipe threading machines.
	03.07 Perform special threading applications.
	03.08 Identify and explain portable power drives.
	03.09 Operate portable power drives.
	03.10 Identify and explain types of power bevellers.
04.0	Accomplish threaded pipe fabrication. The student will be able to:
	04.01 Identify and explain the materials used in threaded systems.
	04.02 Identify and explain pipefittings.
	04.03 Read and interpret screwed fitting joint drawings.
	04.04 Identify and explain types of threads.
	04.05 Determine pipe lengths between fittings.
	04.06 Perform threaded pipe assembly techniques.
05.0	Apply proper use and care of ladders and scaffolds. The student will be able to:
	05.01 Use and care for ladders.
	05.02 Use and care for tubular buck scaffolds.
	05.03 Use and care for pole scaffolds (OES).

	05.04 Use and care for rolling scaffolds.
06.0	Apply proper use and care of motorized equipment. The student will be able to:
	06.01 Use and care for engine-driven generators.
	06.02 Use and care for portable air compressors.
	06.03 Identify and explain portable pumps.
	06.04 Identify and explain forklift trucks (OSHA).
	06.05 Identify and explain hydraulic cranes.
07.0	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:
	07.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
	07.02 Explain emergency procedures to follow in response to workplace accidents.
	07.03 Create a disaster and/or emergency response plan.
08.0	Identify and explain excavations. The student will be able to:
	08.01 Explain properties of soil.
	08.02 Identify and explain types of soils.
	08.03 Explain excavation safety.
	08.04 Explain sloping requirements for different types of solid.
	08.05 Explain excavation support systems.
	08.06 Identify and explain bedding materials.
09.0	Identify and explain underground pipe. The student will be able to:
	09.01 Identify and explain the types of underground piping materials.
	09.02 Identify the size classifications of underground pipe.
	09.03 Identify and explain the use of underground pipefittings.
	09.04 Explain the joining methods for underground pipe.

	09.05 Explain the storage and handling requirements of underground pipe.
10.0	Identify and explain intermediate excavations. The student will be able to:
	10.01 Identify and explain the use of shoring materials.
	10.02 Identify and explain the use of pre-manufactured support systems.
	10.03 Install a vertical shore to be used for shoring.
	10.04 Determine the overall fall of a sewer line.
	10.05 Determine and set the grade and elevation of a trench.
	10.06 Explain backfilling procedures.
11.0	Perform underground pipe installation. The student will be able to:
	11.01 Identify and explain underground pipe installation guidelines.
	11.02 Install concrete pipe.
	11.03 Install carbon steel pipe.
	11.04 Install fiberglass pipe.
	11.05 Install thermoplastic pipe.
12.0	Use drawings and detail sheets. The student will be able to:
	12.01 Identify and explain parts of drawings.
	12.02 Identify and explain types of drawings.
	12.03 Make field sketches.
13.0	Identify and explain piping systems. The student will be able to:
	13.01 Identify and explain the types of piping systems.
	13.02 Identify piping systems according to color-coding.
	13.03 Explain thermal expansion.
	13.04 Explain types and applications of pipe insulation.

14.0	Use pipefitter trade math. The student will be able to:
	14.01 Identify and explain the use of special measuring devices.
	14.02 Use tables of weights and measurements.
	14.03 Use ratios and proportions.
	14.04 Solve basic algebra problems.
	14.05 Solve area problems.
	14.06 Solve volume problems.
	14.07 Solve circumference problems.
	14.08 Solve right triangles.
15.0	Identify and explain socket weld pipe fabrication--The student will be able to:
	15.01 Identify and explain types of socket weld piping materials.
	15.02 Identify and explain socket weld fittings.
	15.03 Read and interpret socket weld piping drawings.
	15.04 Determine pipe lengths between socket weld fittings.
	15.05 Fabricate socket weld fittings to pipe.
16.0	Identify and explain butt weld pipe fabrications. The student will be able to:
	16.01 Identify butt weld piping materials.
	16.02 Identify butt weld fittings.
	16.03 Read and interpret butt weld piping drawings.
	16.04 Set up oxyacetylene equipment.
	16.05 Cut plate steel using an oxyacetylene torch.
	16.06 Bevel plate steel using and oxyacetylene torch.
	16.07 Cut holes using an oxyacetylene torch.

	16.08 Cut pipe using an oxyacetylene torch.
	16.09 Prepare by beveling pipe ends for set-up.
	16.10 Determine pipe lengths between fittings.
	16.11 Select and install backing rings.
	16.12 Use and care for clamps and alignment tools.
	16.13 Perform alignment procedures for various types of fittings.
17.0	Identify, select, use and maintain rigging. The student will be able to:
	17.01 Select, inspect, use and maintain a block and tackle hoist.
	17.02 Select, inspect, use and maintain chain hoists.
	17.03 Select, inspect, use and maintain come-alongs.
	17.04 Select, inspect, use and maintain jacks.
	17.05 Select, inspect, use and maintain a tugger.
	17.06 Identify and explain heavy rigging hardware.
	17.07 Inspect heavy rigging hardware.
	17.08 Read and interpret lifting capacity charts.
	17.09 Explain load balancing.
	17.10 Rig pipe and valves.
	17.11 Plan a rigging job.
18.0	Identify and use pipe hangers and supports. The student will be able to:
	18.01 Identify types of pipe hangers and supports.
	18.02 Identify and interpret pipe support drawings and symbols.
	18.03 Determine field placement of hangers.
	18.04 Identify and install concrete fasteners.

	18.05 Fabricate angle iron brackets to support pipe.

Course Number: BCV0569 Occupational Completion Point: B Industrial Pipefitter – 300 Hours	
19.0	Read advanced blueprints. The student will be able to:
	19.01 Identify symbols and abbreviations on P & IDs.
	19.02 Identify piping arrangement drawings.
	19.03 Read and interpret coordinates, control points, and elevation.
	19.04 Read and interpret P & IDs, plan views, and section views.
	19.05 Identify isometric drawings.
	19.06 Read isometric drawings taken from plan views.
	19.07 Draw isometric drawings.
20.0	Read an interpret pipefitting standards and specifications. The student will be able to:
	20.01 Read and interpret pipefitting standards and codes.
	20.02 Read and interpret pipefitting specifications.
	20.03 Identify pipe and components according to specifications.
21.0	Use, explain, perform, and calculate advanced trade math. The student will be able to:
	21.01 Use tables of equivalents.
	21.02 Use unit conversion tables.
	21.03 Explain thermal expansion.
	21.04 Perform right angle trigonometry.
	21.05 Calculate take-outs using trigonometry.
22.0	Identify, explain, and use motorized equipment. The student will be able to:

	22.01 Identify and explain types of manlifts.
	22.02 Explain manlift safety rules and hazards.
	22.03 Inspect scissors-type and telescoping boom manlifts.
	22.04 Explain the use of cable lifts.
	22.05 Identify and explain the use of hydrostatic pumps.
	22.06 Identify and explain the use of hydroblaster pumps.
	22.07 Identify and explain the use of drain cleaners.
	22.08 Identify and explain the use of pipeline side boom tractors.
	22.09 Use construction trucks and trailers.
23.0	Accomplish above ground pipe installation. The student will be able to:
	23.01 Store pipe and materials.
	23.02 Identify types of flanges.
	23.03 Identify types of gaskets and bolts used with flanges.
	23.04 Explain the location of flange bolt holes.
	23.05 Install pipe with flanged connections.
	23.06 Lay out and install pipe sleeves and floor penetrations.
	23.07 Read and interpret spool sheets.
	23.08 Explain how to erect spools in piping systems.
24.0	Identify and install valves. The student will be able to:
	24.01 Identify types of valves that start and stop flow.
	24.02 Identify types of valves that regulate flow.
	24.03 Identify valves that relieve pressure.
	24.04 Identify valves that regulate the direction of flow.

	24.05 Identify types of valve actuators.
	24.06 Explain how to properly store and handle valves.
	24.07 Explain valve locations and positions.
	24.08 Install valves with threaded ends.
	24.09 Install valves with welded ends.
	24.10 Install valves with flanged ends.
25.0	Field route and accomplish vessel trim. The student will be able to:
	25.01 Secure the work area.
	25.02 Determine field run specifications.
	25.03 Determine the required rigging equipment based on weight, location, and configuration.
	25.04 Determine the load weight for erection equipment.
	25.05 Determine the support needs.
	25.06 Select and install erection materials.
	25.07 Perform screw pipe assembly.
	25.08 Perform socket weld pipe assembly.
	25.09 Perform butt weld pipe assembly.
	25.10 Fabricate the field run of piping.
	25.11 Erect vessel trim.
26.0	Identify, explain, select, and install spring can supports. The student will be able to:
	26.01 Explain standard practice document MSS SP-58.
	26.02 Identify and explain the types of spring can supports.
	26.03 Identify and explain the types of variable spring can supports.
	26.04 Identify and explain the types of constant spring can supports.

	26.05 Explain how to select spring can supports.
	26.06 Explain the storing and handling procedures for spring can supports.
	26.07 Explain how to install spring can supports.
	26.08 Maintain spring can supports.
27.0	Test piping systems and equipment. The student will be able to:
	27.01 Perform pretest requirements.
	27.02 Perform service and flow tests.
	27.03 Perform head pressure tests.
	27.04 Perform hydrostatic tests.
	27.05 Explain how to perform steam blow tests.
28.0	Accomplish basic plumbing. The student will be able to:
	28.01 Identify and explain the basic materials used in manufacturing plumbing fixtures.
	28.02 Identify drainage fixture unit ratings for given type of plumbing fixtures.
	28.03 Identify and explain the operation of lavatories and sinks.
	28.04 Identify and explain water closets, urinals and bidets.
	28.05 Identify and explain drinking fountains and water coolers.
	28.06 Identify and explain mop sinks, service basins, and floor drains.
	28.07 Identify and explain the basic considerations for plumbing fixture installations.
29.0	Plan work activities. The student will be able to:
	29.01 Plan daily work activities.
	29.02 Coordinate work activities with other crafts.
	29.03 Ensure safe working conditions.
	29.04 Determine material requirements.

	29.05 Secure equipment and materials.
	29.06 Prepare to perform a task.
	29.07 Sequence operations specific to the task.
	29.08 Field-verify the installation.
30.0	Accomplish advanced pipe fabrication. The student will be able to:
	30.01 Calculate simple piping offsets.
	30.02 Calculate three line, 45 degree, equal-spread offsets around a vessel.
	30.03 Calculate three line, 45 degree, and unequal-spread offsets.
	30.04 Fabricate tank heating coils.
	30.05 Perform mitering procedures.
	30.06 Layout three and four piece mitered turns.
	30.07 Layout 45 degree laterals using reference.
	30.08 Fabricate dummy legs and trunions out of pipe using references.
	30.09 Perform geometric layout of pipe laterals and supports.
31.0	Perform NDE testing. The student will be able to:
	31.01 Identify potential hazards for testing.
	31.02 Identify types of NDE testing.
	31.03 Prepare welds for NDE testing.
	31.04 Perform visual inspections.
32.0	Accomplish stress relieving and aligning. The student will be able to:
	32.01 Explain thermal expansion.
	32.02 Perform stress-relief procedures.
	32.03 Explain grouting.

	32.04 Explain types of misalignment.
	32.05 Align pipe flanges to equipment nozzles.
33.0	Identify and use steam traps. The student will be able to:
	33.01 Identify types of steam traps.
	33.02 Install steam traps.
	33.03 Troubleshoot steam trap systems.
34.0	Identify and use inline components. The student will be able to:
	34.01 Identify the potential hazards associated with in-line components.
	34.02 Identify in-line special components.
	34.03 Explain how to store and handle in-line special components.
35.0	Use and fabricate special piping. The student will be able to:
	35.01 Install flared and compression joints using copper tubing.
	35.02 Solder and braze joints using copper tubing.
	35.03 Bend pipe to a specified radius.
	35.04 Install glass-lines pipe.
	35.05 Explain how to install hydraulic fitted compression joints.
	35.06 Install grooved pipe couplings.
36.0	Accomplish hot taps. The student will be able to:
	36.01 Explain hot tap safety and potential hazards.
	36.02 Identify and install fittings used with hot taps.
	36.03 Explain the use of hot tap machines.
	36.04 Identify and explain the use of stopples.
37.0	Maintain valves. The student will be able to:

37.01 Remove and install threaded valves.
37.02 Remove and install flanged valves.
37.03 Replace valve stem o-rings.
37.04 Replace bonnet gaskets.
37.05 Explain the purpose of valve packing.
37.06 Repack a valve.

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 co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

This program is daggered. Last year to report enrollment is 28-29. This has been replaced with Brick and Block Masonry (C400600).

Program Title: **Brick and Block Masonry**
Program Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

Career Certificate Program		
Program Number	I463112	
CIP Number	0646010103	
Grade Level	30,31	
Program Length	1650 Hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 9	Communications (Reading and Language Arts): 8

Purpose

The purpose of this program is to prepare students for employment in the brick, block, and concrete masonry industry.

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 selecting and mixing mortars, laying bricks and blocks, and interpreting construction documents.

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

Program Structure

This program is a planned sequence of instruction consisting of three occupational completion points. The recommended sequence allows students to complete specified portions of the program for employment or to remain for advanced training. A student who completes the applicable competencies at any occupational completion point may either continue with the training program or terminate as an occupational completer.

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

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	BCV0330	Masonry Tender	BLDG CONST ¶ 7 ¶G TEC CONSTR ¶ 7 ¶ G TROWEL TR 7G	450 Hours
B	BCV0360	Bricklayer Helper		300 Hours
C	BCV0362	Brickmason 1		450 Hours
	BCV0363	Brickmason 2		450 Hours

Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Investigate the masonry industry.
02.0 Follow safety practices relevant to the masonry industry.
03.0 Describe the properties, characteristics and uses of brick.
04.0 Describe the properties, characteristics and uses of concrete block.
05.0 Use hand tools relevant to the masonry industry.
06.0 Read measurements, drawings and specifications.
07.0 Demonstrate mathematics knowledge and skills.
08.0 Lay brick and/or block to the line.
09.0 Describe the various types and uses of bonding.
10.0 Select and mix mortars and concrete.
11.0 Demonstrate science knowledge and skills. (Optional)
12.0 Clean masonry.
13.0 Identify the various methods of masonry practices.
14.0 Erect and disassemble basic scaffolds.
15.0 Research sustainability issues related to the masonry profession.
16.0 Read construction drawings and specifications.
17.0 Construct residential masonry projects.
18.0 Apply grout and other reinforcement.
19.0 Install metals used in masonry.
20.0 Explain the importance of employability and entrepreneurship skills.
21.0 Perform building layout.
22.0 Demonstrate advanced laying techniques.
23.0 Apply construction techniques and moisture control.
24.0 Apply quality control measures.
25.0 Build foundations.
26.0 Estimate materials and cost.
27.0 Operate and maintain power equipment.
28.0 Perform construction details.
29.0 Demonstrate knowledge of masonry repair and restoration.
30.0 Demonstrate productivity skills.
31.0 Demonstrate an understanding of masonry in high-rise construction.
32.0 Demonstrate knowledge of specialized materials and techniques.

Florida Department of Education
Student Performance Standards

Program Title: **Brick and Block Masonry**
Career Certificate Program Number: **I463112**

Course Number: BCV0330 **Occupational Completion Point: A** **Masonry Tender – 450 Hours**	
01.0	Investigate the masonry industry. The student will be able to:
01.01	Summarize the history of the masonry industry.
01.02	Explain the importance of the masonry industry to the local, state and national economy.
01.03	Identify employment and advancement opportunities in the masonry industry.
01.04	Explain the factors involved in good-quality work.
01.05	Describe modern masonry materials.
02.0	Follow safety practices relevant to the masonry industry. The student will be able to:
02.01	Identify causes and types of accidents.
02.02	Explain the purpose of the Occupational Safety and Health Administration (OSHA) in jobsite safety.
02.03	Describe the OSHA "Right-to-Know" Law as recorded in (29 CFR-1910.1200)
02.04	Recognize jobsite hazards and risk assessment techniques.
02.05	Describe first-aid procedures.
02.06	Follow safety practices when using tools and equipment.
02.07	Explain the importance of hazard communications (HazCom) and Material Safety Data Sheets (MSDS).
02.08	Demonstrate the use of and care of appropriate personal protective equipment (PPE).
02.09	Demonstrate proper lifting and lowering procedures (How to properly pick up and put down materials).
03.0	Describe the properties, characteristics and uses of brick. The student will be able to:
03.01	Explain the brick-manufacturing process.

	03.02 Identify the properties and characteristics of brick.
	03.03 Distinguish between standard and modular bricks.
	03.04 Describe the different types of bricks and their principal uses.
	03.05 Identify brick positioning in a wall.
	03.06 Build 4” brick corner return leads.
	03.07 Build a wall 4’ high and 8’ long.
04.0	Describe the properties, characteristics and uses of concrete block. The student will be able to:
	04.01 Explain the manufacturing process of concrete block.
	04.02 Identify the properties and characteristics of concrete block.
	04.03 Describe the different types, including shapes and sizes, of concrete blocks and their principal uses.
	04.04 Build an 8” block corner return lead 7 courses high.
05.0	Use hand tools relevant to the masonry industry. The student will be able to:
	05.01 Identify, care for and use basic hand tools.
	05.02 Select hand tools for specific jobs.
	05.03 Read ruler to the 1/16" increment.
	05.04 Read brick-spacing rules and/or brick modular rules.
	05.05 Course brick to a given height with the brick spacing rule and/or the modular rule.
06.0	Read measurements, drawings and specifications. The student will be able to:
	06.01 Work with denominate numbers.
	06.02 Identify the ingredients and properties of mortars.
	06.03 Read a mason’s measure.
	06.04 Convert measurements in the U.S. standard (English) system into metric equivalents.
	06.05 Read construction documents and identify basic parts of a drawing set.

	06.06 Discuss the different types of specifications used in the building industry and the sections that pertain to masonry.
07.0	Demonstrate mathematics knowledge and skills. The students will be able to:
	07.01 Demonstrate knowledge of arithmetic operations.
	07.02 Analyze and apply data and measurements to solve problems and interpret documents.
	07.03 Construct charts/tables/graphs using functions and data.
08.0	Lay brick and/or block to the line. The student will be able to:
	08.01 Spread mortar for brick and/or block.
	08.02 Pull a line from established leads.
	08.03 Set up masonry materials.
	08.04 Butter head joints.
	08.05 Lay brick to the line.
	08.06 Maintain proper spacing of head and bed joints.
	08.07 Cut brick with a hammer, a brick set and a trowel.
	08.08 Point and tool joints in brick walls.
	08.09 Re-temper mortar.
	08.10 Demonstrate proper handling of materials to prevent damage.
	08.11 Repeat the above ten tasks with 8" concrete block.
09.0	Describe the various types and uses of bonding. The student will be able to:
	09.01 Define and describe pattern, structural and adhesive bonding.
	09.02 Differentiate among and use stretcher, common, English, English cross, Flemish and stack bonds.
10.0	Select and mix mortars and concrete. The student will be able to:
	10.01 Identify types of mortars and identify types to use on various concrete masonry units (CMU).
	10.02 Identify the ingredients and properties of mortars.

	10.03 Identify the properties and characteristics of concrete.
	10.04 Identify colored mortars (admix and factory-blended).
	10.05 Identify the types and purposes of grouts.
	10.06 Store and place materials.
	10.07 Select mortars and concrete.
	10.08 Mix mortars by hand and by machine.
	10.09 Mix concrete by hand and by machine.
	10.10 Clean up tools, equipment and the work site.
	10.11 Identify common problems found in mortar application and their uses.
11.0	Demonstrate science knowledge and skills. (Optional). The students will be able to:
	11.01 Explain molecular action as a result of temperature extremes, chemical reaction and moisture content.
	11.02 Explain pressure measurement in terms of Pounds per Square Inch (PSI) and inches of mercury.
	11.03 Discuss the role of creativity in constructing scientific questions, methods and explanations.
	11.04 Formulate scientifically investigable questions, construct investigations, collect and evaluate data and develop scientific recommendations based on findings.
	11.05 Identify health-related problems caused by exposure to work-related chemicals and hazardous materials.
	11.06 Describe proper precautions for handling work-related chemicals and hazardous materials.
12.0	Clean masonry. The student will be able to:
	12.01 Follow safety practices when cleaning masonry.
	12.02 Identify reasons for cleaning.
	12.03 Identify and select cleaning materials and equipment.
	12.04 Prepare cleaning solutions.
	12.05 Point new and old work.
	12.06 Prepare the area and protect surrounding area from masonry cleaning solutions.

	12.07 Clean the wall using various methods.
13.0	Identify the various methods of masonry practices. The student will be able to:
	13.01 Identify the methods of basic building layouts.
	13.02 Identify the methods of digging and pouring footings.
	13.03 Identify the methods of forming, grading and pouring concrete slabs.
	13.04 Identify the different types of reinforced masonry, flashing, wall reinforcement and ties and use proper technique for installation.
	13.05 Identify measuring tools.
	13.06 Identify power equipment.
14.0	Erect and disassemble basic scaffolds. The student will be able to:
	14.01 Follow safety practices when working with ladders and scaffolds.
	14.02 Erect and disassemble basic scaffolds.
15.0	Research sustainability issues related to the masonry profession--The student will be able to:
	15.01 Describe the impact of the construction industry on the natural environment.
	15.02 Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.
	15.03 Identify and analyze sustainable alternatives to conventional masonry practices.
	15.04 Identify specific practices that can lessen adverse impacts on the environment.
	15.05 Describe the building assessment tools such as Leadership in Energy and Environmental Design (LEED).
	15.06 Identify construction activities pertaining to the masonry profession that contribute to a project’s overall sustainability.
16.0	Read construction drawings and specifications. The student will be able to:
	16.01 Identify types of drawings.
	16.02 Identify symbols on the drawings.
	16.03 Read and interpret simple drawings.
	16.04 Read and interpret specifications.

	16.05 Explain the importance of following local, state and national codes and standards.
	16.06 Interpret a finished schedule.
	16.07 Use an architect's scale.
	16.08 Use construction documents to estimate material quantities.
	16.09 Demonstrate ability to make simple sketches.
17.0	Construct residential masonry projects. The students will be able to:
	17.01 Explain the requirements for construction of various types of residential foundations.
	17.02 Identify and explain the characteristics, uses and installation techniques for brick pavers.
	17.03 Lay out and build steps, patios and decks made from masonry units.
	17.04 Describe the process of tying brick veneer to an established wall.
18.0	Apply grout and other reinforcement. The students will be able to:
	18.01 Name and describe the primary ingredients in grout and their properties.
	18.02 Identify the different types of grout used in masonry work.
	18.03 Describe common admixtures and their uses.
	18.04 Describe the use of steel bar reinforcement in masonry construction.
	18.05 Apply grout in low and high lifts using the proper techniques. (Optional)
	18.06 Place grout in a hollow block wall and rod it into place. (Optional)
19.0	Install metals used in masonry. The students will be able to:
	19.01 Describe the uses and installation of vertical reinforcement.
	19.02 Describe the uses and installation of different types of horizontal joint reinforcement and ties.
	19.03 Describe the uses and installation of different anchors, fasteners and embedded items.
	19.04 Describe and/or install hollow metal frames.
	19.05 Describe the functions of sills and lintels.

	19.06 Describe and/or install metal hardware.

Course Number: BCV0360 Occupational Completion Point: B Bricklayer Helper – 300 Hours	
20.0	Explain the importance of employability and entrepreneurship skills. The students will be able to:
	20.01 Identify and demonstrate positive work behaviors needed to be employable.
	20.02 Develop personal career plan that includes goals, objectives and strategies.
	20.03 Examine licensing, certification and industry credentialing requirements.
	20.04 Maintain a career portfolio to document knowledge, skills and experience.
	20.05 Evaluate and compare employment opportunities that match career goals.
	20.06 Demonstrate ability to complete job applications and make a resume.
	20.07 Identify and exhibit traits for retaining employment.
	20.08 Identify opportunities and research requirements for career advancement.
	20.09 Research the benefits of ongoing professional development.
	20.10 Examine and describe entrepreneurship opportunities as a career planning option.
21.0	Perform building layout. The student will be able to:
	21.01 Read and interpret plot plans.
	21.02 Establish building corners.
	21.03 Check and/or establish 90-degree angles using the 3-4-5 rule.
	21.04 Use optical and laser leveling instruments, transit and leveling rod.
	21.05 Describe how to build batter boards and establish building lines and elevations.
	21.06 Describe how to dig, prepare and pour footings to local codes and standards.
22.0	Demonstrate advanced laying technique. The student will be able to:

	22.01 Recognize the structural principles and fundamental uses of basic types of walls.
	22.02 Recognize the requirement for and function of control joints and expansion joints.
	22.03 Describe the various types of walls using proper reinforcement, jointing and bonding techniques.
	22.04 Describe how to lay out specialty structures such as maintenance holes, segmented block walls and screens.
	22.05 Identify and explain the different types of masonry arches used today.
	22.06 Lay out a semicircular arch and a jack arch. (Optional)
	22.07 Lay out and build chimneys and fireplaces. (Optional)
23.0	Apply construction techniques and moisture control. The student will be able to:
	23.01 Construct or describe the process of placing masonry around windows, doors and other openings.
	23.02 Construct or describe the process of building pilasters and other types of bracing.
	23.03 Construct or describe the process of installing insulation used in conjunction with masonry construction.
	23.04 Identify the need for moisture control in various types of masonry construction and describe the techniques used to eliminate moisture problems.
	23.05 Construct or describe the process of building corbelling in a double-wythe wall.
	23.06 Construct or describe the process of joining intersecting walls.
	23.07 Construct or describe the process of installing flashing.
24.0	Apply quality control measures. The student will be able to:
	24.01 Describe industry standards for quality control.
	24.02 Describe how to build masonry sample panels and prisms.
	24.03 Perform a slump test.
	24.04 Describe and perform field inspections.
25.0	Build foundations. The student will be able to:
	25.01 Build an 8" block corner 7 courses high.
	25.02 Build an 8" block corner to the correct height and range of a given foundation batter board line. (Optional)

	25.03 Bond and build an 8" block corner to the correct height and range on the opposite corner of a given foundation batter board line.
	25.04 Pull a line and build an 8" block wall between the block corners.
	25.05 Establish and build the other corner leads.
	25.06 Build or describe the process of building foundation walls to floor elevations.
	25.07 Describe the process of making foundation walls waterproof, if required.
	25.08 Describe the process of installing flashing, anchor bolts, termite shields and weep holes; install vents (if a wooden floor system is used).
26.0	Estimate materials and cost. The student will be able to:
	26.01 Estimate the materials needed for a specific job.
	26.02 Estimate the cost of the materials, labor, unit/ labor costs and sales tax.
27.0	Operate and maintain power equipment. The student will be able to:
	27.01 Follow safety practices when using and maintaining power equipment.
	27.02 Use masonry saw with an abrasive blade to cut masonry units.
	27.03 Use masonry saw with a diamond blade to cut masonry units.
	27.04 Set up, operate and maintain power tools and equipment (mixer, hand held saw, drill, etc.).

Course Number: BCV0362 Occupational Completion Point: C Brickmason 1 – 450 Hours	
28.0	Perform construction details. The student will be able to:
	28.01 Build 4" and/or 8" double-wythe brick corners.
	28.02 Build 4", 6” and 12" block corners. (Optional)
	28.03 Build reinforced masonry walls, composite walls and cavity walls.
	28.04 Erect corner poles and lay out brick coursing on story pole.
	28.05 Course brick heights.

	28.06 Build brick and/or block sills, steps, piers, pilasters, columns, brick chase, flue, paving, BBQ pits and planters. (Optional)
	28.07 Construct a brick veneer wall.
	28.08 Install precast and built-in lintels. (Optional)
	28.09 Build modular brick walls.
	28.10 Install adhered stone veneer installation. (Optional)
	28.11 Install door jams. (Optional)
29.0	Demonstrate knowledge of masonry repair and restoration. The student will be able to:
	29.01 Recognize signs of deterioration in masonry structures.
	29.02 Describe the causes of efflorescence, cracking and faulty mortar joints.
	29.03 Describe the procedures for preventing and correcting efflorescence, cracking and faulty mortar joints.
	29.04 Describe the procedures for preventing and correcting water damage in basements.
	29.05 Demonstrate proper use of masonry sealers.

Course Number: BCV0363 Occupational Completion Point: C Brickmason 2 – 450 Hours	
30.0	Demonstrate productivity skills. The student will be able to:
	30.01 Lay and joint standard brick on a straight brick-veneer wall with established leads. (NOTE: Emphasis here is on proper technique, not on productivity.)
	30.02 Lay and joint 8" block on a straight block wall with established leads. (NOTE: Emphasis here is on proper technique, not on productivity.)
31.0	Demonstrate an understanding of masonry in high-rise construction. The student will be able to:
	31.01 Recognize and explain the use of high-rise construction equipment.
	31.02 Identify construction sequence in high-rise construction.
	31.03 Describe the safety procedures in high-rise construction.
	31.04 Describe how to safely work with materials handling equipment in high-rise construction.

	31.05 Properly put on a safety harness, lanyard and lifeline.
	31.06 Demonstrate hand signals used for lifting materials.
32.0	Demonstrate knowledge of specialized materials and techniques. The student will be able to:
	32.01 Explain the various techniques used to provide adequate protection during hot- and cold-weather masonry construction.
	32.02 Describe all-weather construction techniques.
	32.03 Describe techniques for surface-bonding mortar. (Optional)
	32.04 Demonstrate techniques for construction of stone walls and other stone building surfaces. (Optional)
	32.05 Replace a damaged brick in a wall. (Optional)
	32.06 Repair mortar joints. (Optional)

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 co-curricular 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.

Cooperative Training – OJT

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

Basic Skills

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

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

Accommodations

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Tile Setting [for Florida Department of Corrections Use Only!]**
Program Type: **Career Preparatory**
Career Cluster: **Architecture and Construction**

Career Certificate Program		
Program Number	N/A **	
CIP Number	N/A **	
Grade Level	30,31	
Program Length	500 Hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics) 9	Communications (Reading and Language Arts): 9

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Purpose

This program prepares students for work as tile setters.

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 communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, proper care and use of hand tools and equipment, tile setting materials, basic blueprint reading, trade math and estimating materials for tile setting.

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 one occupational completion point (OCP).

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	N/A **	Hard Tile Setter 1	TEC CONSTR ¶ 7 ¶ G BLDG CONST ¶ 7 ¶ G TILE SET 7G	250 Hours
	N/A **	Hard Tile Setter 2		250 Hours

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Common Career Technical Core – Career Ready Practices

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

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

2. Apply appropriate academic and technical skills.

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

4. Communicate clearly, effectively and with reason.

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

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

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

9. Model integrity, ethical leadership and effective management.

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

11. Use technology to enhance productivity.

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

Standards

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

01.0 Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
02.0 Prepare walls for drywall application of ceramic tile.
03.0 Prepare walls using wire lathe, scratch coat and screed coat for wet wall application of ceramic tile.
04.0 Apply tile and grout utilizing drywall techniques.
05.0 Apply tile and grout utilizing wet wall techniques.
06.0 Layout, cut and install ceramic tile on walls and floors.
07.0 Interpret blueprints and estimate materials for tile work.
08.0 Demonstrate mathematics knowledge and skills.
09.0 Proportion and mix mortar for tile installation.
10.0 Demonstrate appropriate understanding of basic science.
11.0 Explain the importance of employability and entrepreneurship skills.

Florida Department of Education
Student Performance Standards

Program Title: **Tile Setting** **[for Florida Department of Corrections Use Only!]**
Career Certificate Program Number: **N/A**

Course Number: N/A **Occupational Completion Point: A** **Hard Tile Setter 1 – 250 Hours**	
01.0	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:
01.01	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.02	Explain emergency procedures to follow in response to workplace accidents.
01.03	Create a disaster and/or emergency response plan.
02.0	Prepare walls for drywall application of ceramic tile. The student will be able to:
02.01	Determine readiness of subsurface for tile installation.
02.02	Repair damaged drywall.
02.03	Sand and finish drywall for application of tile.
03.0	Prepare walls using wire lath, scratch coat and screed coat for wet wall application of ceramic tile. The student will be able to:
03.01	Install screed mud over concrete slab to install shower floor.
03.02	Measure and cut metal lath to size for walls and ceilings with tin snips.
03.03	Tack lath to wall and ceiling surfaces with staple gun or hammer.
03.04	Spread plaster base over lath with trowel and level plaster to specified thickness, using screed.
03.05	Spread concrete on subfloor with trowel and level it with screed.
03.06	Remove and replace existing backing materials in wet area.
04.0	Apply tile and grout utilizing drywall techniques. The student will be able to:
04.01	Set tile on drywall with thinset.

	04.02 Set tile using mastic adhesives.
	04.03 Position tile and tap it with trowel handle to affix tile to plaster or adhesive.
	04.04 Install tile over wire mesh and concrete masonry units.
	04.05 Install tile over wood counter top.
	04.06 Install counter top backsplash designs.
	04.07 Layout countertop and backsplash designs.
	04.08 Grout counter top and backsplash.
	04.09 Grout floor tile.
05.0	Apply tile and grout utilizing wet wall techniques. The student will be able to:
	05.01 Grout tile on walls and floors.
	05.02 Install tile floor over concrete slab using thinset.
	05.03 Replace grout.
	05.04 Grout wet area installation.
	05.05 Install tile in shower stall.
	05.06 Lay out shower.
	05.07 Build a shower curb.
	05.08 Prepare shower floor for tile installation.
	05.09 Install wire mesh mortar units in a shower.
	05.10 Install wire mesh mortar units in a tub surround.

Course Number: N/A **Occupational Completion Point: A** **Hard Tile Setter 2 – 250 Hours**	
06.0	Layout, cut and install ceramic tile on walls and floors. The student will be able to:

06.01 Select and use tile setting tools.
06.02 Use tile nippers to nip different types of tile.
06.03 Cut and shape tile with tile cutters and biters.
06.04 Cut different types of tile with tile hand cutters.
06.05 Cut tile with rod saw.
06.06 Use a level.
06.07 Use electric drill.
06.08 Use tile saw.
06.09 Use tile cutter.
06.10 Cut tile with electric saw.
06.11 Clean tools and maintain in working order.
06.12 Smooth cut tile edges with grinding stone.
06.13 Select and use measurement tools.
06.14 Install tile plumb and level using level.
06.15 Square tile layouts using a steel square.
06.16 Maintain true and correct tile work with square.
06.17 Maintain clean, neat and safe work area.
06.18 Practice personal and general job safety procedures of tile setters.
06.19 Miter base tile to fit angles.
06.20 Miter cap tile to fit angles.
06.21 Draw level starting and field lines, and level curbs and door jambs using a level.
06.22 Lay down working, finish, plumb and level lines using a chalk line.
06.23 Butt tile rows using straightedge on starting line.

	06.24 Figure layout.
	06.25 Measure, cut and install metal lath for shower pan.
	06.26 Chisel tile and setting related substances.
	06.27 Lay out tile setting jobs.
	06.28 Lay out floor.
	06.29 Install tile over previously poured interior concrete floor.
	06.30 Install tile over wood floor.
	06.31 Install ceramic tile over existing floor covering.
	06.32 Install tile over existing tile.
	06.33 Install tile floor over wood floor using mastic adhesive.
	06.34 Install floor tile over wire mesh mortar units.
	06.35 Install tile on exterior floor.
	06.36 Install ceramic tile over laminated counter top and backsplash.
	06.37 Install ceramic tile over ceramic tile on tub surround
	06.38 Install marble window sills.
	06.39 Install tile window sills.
	06.40 Install a complete shower floor.
	06.41 Clean aged tile.
	06.42 Replace loose or damaged tile.
	06.43 Measure and cut marble window sills.
	06.44 Remove and replace shower floor and base.
	06.45 Install fixtures.
07.0	Interpret blueprints and estimate materials for tile work. The student will be able to:

	07.01 Apply basic math skills to tile setting.
	07.02 Measure floors and walls using steel measuring tapes.
	07.03 Measure tile cuts using wood folding rule.
	07.04 Figure total tile amounts needed for job.
	07.05 Estimate how many square feet of tile needed for bathroom walls.
	07.06 Estimate how many square feet of tile needed for floor areas.
	07.07 Calculate costs.
	07.08 Maintain records of materials used.
	07.09 Read blueprints and specification sheets that apply to tile setting.
	07.10 Examine blueprints, measure and mark surfaces to be covered and lay out work.
	07.11 Prepare list of supplies and tools needed to complete a job.
08.0	Demonstrate mathematics knowledge and skills. The students will be able to:
	08.01 Demonstrate knowledge of arithmetic operations.
	08.02 Analyze and apply data and measurements to solve problems and interpret documents.
	08.03 Construct charts/tables/graphs using functions and data.
	08.04 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares and cylinders.
	08.05 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
	08.06 Add, subtract, multiply and divide using fractions, decimals and whole numbers.
	08.07 Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
	08.08 Demonstrate an understanding of federal, state and local taxes and their computation.
09.0	Proportion and mix mortar for tile installation. The student will be able to:
	09.01 Mix setting materials manually with hand tools and equipment.
	09.02 Mix setting materials with a power mixer.

	09.03 Follow safety practices when mixing setting materials.
	09.04 Follow manufacturer directions.
	09.05 Select and mix adhesives to set tile.
	09.06 Determine quantity and type of setting materials needed.
	09.07 Proportion setting materials ingredients for specific uses.
10.0	Demonstrate appropriate understanding of basic science. The student will be able to:
	10.01 Understand molecular action as a result of temperature extremes, chemical reaction and moisture content.
	10.02 Draw conclusions or make inferences from data.
	10.03 Identify health-related problems, which may result from exposure to work related chemicals and hazardous materials and know the proper precautions required for handling such materials.
	10.04 Understand pressure measurement in terms of PSI, inches of mercury and KPA.
11.0	Explain the importance of employability and entrepreneurship skills. The students will be able to:
	11.01 Identify and demonstrate positive work behaviors needed to be employable.
	11.02 Develop personal career plan that includes goals, objectives and strategies.
	11.03 Examine licensing, certification and industry credentialing requirements.
	11.04 Maintain a career portfolio to document knowledge, skills and experience.
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