

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
Standard Length	64 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9021 - Heating, Air Conditioning, and Refrigeration Mechanics and Installers

**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 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 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 Identify, use and maintain the tools and tool accessories used in the heating, air-conditioning and refrigeration industry.
- 03.0 Demonstrate mathematics knowledge and skills.
- 04.0 Demonstrate a practical knowledge of basic electricity and of the electrical components of heating, air-conditioning and refrigeration equipment.
- 05.0 Troubleshoot heating, air-conditioning and refrigeration electrical control systems and their components.
- 06.0 Select and test electrical generation and distribution components for commercial heating and air conditioning systems.
- 07.0 Maintain, test and troubleshoot electrical motors and their components for commercial heating and air-conditioning systems.
- 08.0 Troubleshoot and wire electrical motors and their components.
- 09.0 Operate solid-state electronics as used in heating, air-conditioning and refrigeration systems.
- 10.0 Evaluate single-phase and three-phase power as used in heating, air-conditioning and refrigeration systems.
- 11.0 Explain the function of basic electronics.
- 12.0 Describe the history and concepts of heating, air-conditioning and refrigeration.
- 13.0 Explain the properties of matter and heat behavior.
- 14.0 Analyze fluids, pressures, refrigerants and related codes.
- 15.0 Evaluate heating, air-conditioning and refrigeration system components and accessories.
- 16.0 Select appropriate commercial compressors.
- 17.0 Test and adjust commercial evaporative condensers.
- 18.0 Maintain, test and troubleshoot commercial evaporators.
- 19.0 Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
- 20.0 Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing.
- 21.0 Utilize and operate mechanical refrigeration servicing and testing equipment.
- 22.0 Assist in the installation of a residential heating and air-conditioning system and determine start-up procedures.
- 23.0 Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems.
- 24.0 Demonstrate a working knowledge of refrigerants and oils.
- 25.0 Conduct system startup and shutdown.
- 26.0 Explain the importance of employability and entrepreneurship skills
- 27.0 Use combustion-type heating servicing and testing equipment.
- 28.0 Troubleshoot combustion gas valves and regulators as used in heating, air-conditioning, refrigeration and ventilation systems.
- 29.0 Maintain, troubleshoot and repair commercial heating systems.
- 30.0 Explain how to install, maintain and repair heating, air-conditioning and refrigeration systems.
- 31.0 Demonstrate knowledge of retail refrigeration systems.
- 32.0 Demonstrate knowledge of commercial and industrial refrigeration systems.
- 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 Read construction documents.
- 41.0 Interpret, use and modify construction drawings and specifications.
- 42.0 Design heating and cooling systems.
- 43.0 Troubleshoot and repair commercial heating and air-conditioning systems.
- 44.0 Calculate commercial heating and air-conditioning loads.
- 45.0 Install air distribution systems.
- 46.0 Evaluate commercial airside systems.
- 47.0 Balance an air distribution system.
- 48.0 Select energy conservation equipment.
- 49.0 Analyze building management systems.
- 50.0 Recommend alternative heating and cooling systems for various case studies.

Florida Department of Education  
Student Performance Standards

Program Title: Air Conditioning, Refrigeration and Heating Systems Technology  
 CIP Number: 0615050100  
 Program Length: 64 Credit Hours  
 SOC Code(s): 49-9021

**The AAS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS. 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 and use 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	Understand and apply Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), 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	Follow safety precautions when using hand and power tools.

01.12	Explain emergency procedures to follow in response to workplace accidents.
01.13	Create a disaster and/or emergency response plan.
02.0	Identify, use and maintain the tools and tool accessories used in the heating, air-conditioning and refrigeration industry--The student will be able to:
02.01	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.
02.02	Apply appropriate care and maintenance procedures for tools and tool accessories, following the directions in the tool-equipment manufacturer's manual.
03.0	Demonstrate mathematics knowledge and skills--The student 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.
04.0	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:
04.01	Explain the principles of electricity.
04.02	Explain single- and three-phase power distribution.
04.03	Define and explain watts, ohms, volts and amps.
04.04	Identify and explain electrical measuring tools and devices.
04.05	Explain the standards for and ways to measure watts, resistance, voltage and amperage, using appropriate instruments or devices.
04.06	Identify and explain appropriate electrical wiring symbols.
04.07	Draw and explain a wiring schematic diagram for a control system.
04.08	Create a wiring schematic for an air conditioner an electric furnace, a heat pump, an oil furnace (optional) and a gas furnace.
04.09	Explain codes and standards and safety requirements for working with the electrical components used in heating, air conditioning and refrigeration.

04.10	Troubleshoot protection devices, such as fuses and breakers.
05.0	Troubleshoot heating, air-conditioning and refrigeration electrical control systems and their components--The student will be able to:
05.01	Identify and explain the operations of electrical control systems and their components (zone damper motors, dual fuel lock out controls, outdoor thermostats/low ambient controls, defrost controls/timers and auxiliary heating controls, contactors, relays, circuit boards, motors, solenoids, and thermostats.).
05.02	Identify, install and troubleshoot controls for heating, air-conditioning and refrigeration systems.
05.03	Explain the operation of different types of electromechanical communicating, humidity control, and Wi-Fi operating thermostats.
05.04	Wire basic heating, air-conditioning and refrigeration systems.
05.05	Troubleshoot operational problems for different types of electromechanical communicating, humidity control, and Wi-Fi operating thermostats.
05.06	Explain the electrical and mechanical operations of the basic heat pump.
06.0	Select and test electrical generation and distribution components for commercial heating and air conditioning systems--The student will be able to:
06.01	Determine wire sizes and voltage drops.
06.02	Describe the operation of various types of transformers.
06.03	Draw and identify various power-transformers.
06.04	Test, size and replace protection devices such as fuses and breakers, motor starters and overloads.
07.0	Maintain, test and troubleshoot electrical motors and their components for commercial heating and air-conditioning systems--The student will be able to:
07.01	Explain how alternating current is developed and draw a sine wave.
07.02	Identify single-phase and three-phase wiring arrangements.
07.03	Explain how phase shift occurs in inductors and capacitors.

07.04	Describe the types of capacitors and their applications.
07.05	Explain the operation of single-phase and three-phase induction motors.
07.06	Identify the various types of single-phase motors and their applications.
07.07	Identify and explain the operations and applications of various types of electrical motors and their components as used in commercial heating and air-conditioning systems.
07.08	Maintain, test and troubleshoot various types of commercial electrical motors and their components as used in commercial heating and air-conditioning systems.
07.09	Demonstrate the proper use of motor testing equipment.
08.0	Troubleshoot and wire electrical motors and their components--The student will be able to:
08.01	Identify and explain the functions of various types of motors and their components.
08.02	Troubleshoot, test and analyze motors, using various methods.
08.03	Identify, troubleshoot and wire various types of electric motors.
08.04	Reverse the rotation of a motor.
09.0	Operate solid-state electronics as used in heating, air-conditioning and refrigeration systems--The student will be able to:
09.01	Explain the basic principles and functions of Direct Digital Control (DDC).
09.02	Explain basic solid-state circuits and boards.
09.03	Identify, test and replace circuits and boards.
09.04	Program a programmable thermostat.
10.0	Evaluate single-phase and three-phase power as used in heating, air-conditioning and refrigeration systems --The student will be able to:
10.01	Explain how the principles of designing an electrical system for residential heating and air-conditioning systems apply to commercial heating and air-conditioning systems.

10.02	Define and compare single- and multiphase voltage and current related to commercial heating and air-conditioning systems.
10.03	Calculate various circuit loads in commercial heating and air-conditioning applications using Ohm's law.
10.04	Troubleshoot electrical circuits for commercial heating and air-conditioning systems
11.0	Explain the function of basic electronics--The student will be able to:
11.01	Explain the basic theory of electronics and semiconductors.
11.02	Explain how various semiconductor devices such as diodes, LEDs and photo diodes work, and how they are used in power and control circuits.
11.03	Identify different types of resistors and explain how their resistance values can be determined.
11.04	Describe the operation and function of thermistors.
12.0	Describe the history and concepts of heating, air-conditioning and refrigeration--The student will be able to:
12.01	Explain the basic principles of heating, ventilation and air-conditioning.
12.02	Identify and explain the four major refrigeration components.
12.03	Identify and explain the characteristics of a compression-cycle refrigerant system.
12.04	Differentiate between air-conditioning and refrigeration.
12.05	Differentiate between split systems and package systems.
12.06	Describe the benefits of conditioned air and environments.
12.07	Identify various professional organizations, associations and societies and explain their purposes.
13.0	Explain the properties of matter and heat behavior--The student will be able to:
13.01	Describe and explain freezing point, critical temperature and absolute zero.



13.02	Explain the gas laws (Dalton, Boyle and Charles) used when dealing with air and its properties.
13.03	Describe matter, heat and heat transfer.
13.04	Differentiate between heat and temperature.
13.05	Explain and distinguish among the characteristics of the three states of matter.
13.06	Explain the relationship between temperature and humidity.
13.07	Differentiate between latent heat and sensible heat.
14.0	Analyze fluids, pressures, refrigerants and related codes--The student will be able to:
14.01	Identify the refrigeration cycle.
14.02	Identify and explain general safety issues and EPA rules and regulations regarding the handling of refrigerants.
14.03	Define and explain pressure, fluid and temperature.
14.04	Explain the standards for and ways to measure and calculate absolute and gauge pressures.
14.05	Identify and explain the classifications, properties and uses of different refrigerants.
14.06	Explain how fluids react and flow in a closed versus an open environment or vessel.
14.07	Define and identify "color-coding" of refrigerant cylinders.
14.08	Compare Pressure and Temperature (P/T) charts.
14.09	Explain the proper methods of transferring, storing and recovering refrigerants.
14.10	Explain the effects of an improper refrigerant and contaminants in a system.
15.0	Evaluate heating, air-conditioning and refrigeration system components and accessories--The student will be able to:

15.01	Explain the types, operation, use and maintenance requirements of
	a. Compressors (such as reciprocating, rotary, screw and scroll)
	b. Condensers and evaporators (such as evaporative condensers, evaporative coils, shell and tube, tube within a tube and fin and tube)
	c. Metering devices (such as adjusting automatic and thermostatic expansion valves, fixed orifices and other devices available on the local market)
15.02	Evaluate metering-device performance.
15.03	Explain the methods of compression, lubrication and compressor loading and unloading.
15.04	Analyze the operating condition of a compressor.
15.05	Test, troubleshoot and correct the causes of mechanical problems in a heating, air-conditioning and refrigeration system.
15.06	Identify the location and explain the uses of refrigerant flow accessories.
15.07	Identify the location and explain the uses of heating, air-conditioning and refrigeration-system accessories (such as receivers, dryers/filters, solenoid valves, heat exchangers, accumulators, suction filter, oil separators, evaporator pressure-regulating valve, crankcase pressure-regulating valves, hot gas bypass valves and check valves).
15.08	Evaluate system performance.
16.0	Select appropriate commercial compressors--The student will be able to:
16.01	Compare commercial-compressor requirements with those for residential and light commercial heating and air-conditioning systems.
16.02	Discuss appropriate commercial compressors for cooling requirements.
16.03	Describe the mechanical operation for each type of compressor.
16.04	Explain compressor lubrication methods.
16.05	Explain methods used to control compressor capacity.

16.06	Describe how compressor protection devices operate.
16.07	Perform the common procedures used when field servicing open and semi-hermetic compressors.
17.0	Test and adjust commercial evaporative condensers--The student will be able to:
17.01	Determine the proper air and fluid flow for commercial evaporative condensers.
17.02	Test and adjust the airflow for proper temperature difference.
17.03	Test and adjust the water flow for proper GPM and temperature difference.
17.04	Check for proper water treatment.
18.0	Maintain, test and troubleshoot commercial evaporators--The student will be able to:
18.01	Determine the operational requirements for evaporators used in commercial heating and air-conditioning applications.
18.02	Discuss appropriate evaporators for commercial heating and air-conditioning systems
18.03	Maintain, test and adjust various commercial heating and air-conditioning accessories.
18.04	Maintain, test and adjust commercial heating and air-conditioning accessories.
18.05	Compare commercial accessories with residential and light- commercial-heating and air-conditioning accessories.
18.06	Select the heating and air-conditioning accessories appropriate for various commercial applications.
19.0	Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry--The student will be able to:
19.01	Identify and explain the purpose of the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
19.02	Bend tubing, using tube benders.
19.03	Connect tubing using flared fittings and compression fittings.

19.04	Connect tubing, using solderless connectors.
19.05	Connect tubing, using a swaged-joint connection.
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.
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 heating, air-conditioning, refrigerant and ventilation accessories.
19.13	Fabricate and leak-test the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
19.14	Demonstrate proper safety measures when fabricating and servicing piping, tubing and fittings.
20.0	Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing--The student will be able to:
20.01	Identify and explain various types of heating, air-conditioning and refrigeration piping.
20.02	Identify basic principles of sizing various heating, air conditioning, refrigeration and ventilation for various tasks.
20.03	Explain pressure and temperature drops.
21.0	Utilize and operate mechanical refrigeration servicing and testing equipment--The student will be able to:
21.01	Identify the effects of superheat and sub-cooling on a system.
21.02	Identify and explain the functions of servicing and testing equipment (such as vacuum pumps, micron gauges, EPA-approved equipment, leak detectors and charging systems).

21.03	Operate a refrigerant recovery system.
21.04	Apply specific safety and recovery practices for refrigerants used in the industry.
21.05	Apply specific safety practices as they relate to handling and storing cylinders and materials.
21.06	Explain the standards for and ways to measure, test, maintain and evacuate a mechanical heating, air-conditioning and refrigeration system.
21.07	Evacuate the refrigerant system with various vacuum methods.
21.08	Demonstrate compliance with Environmental Protection Agency (EPA) rules and regulations and, if possible, take the EPA test.
21.09	Charge various air-conditioning and mechanical refrigeration systems by various methods.
21.10	Demonstrate the effects of superheat and sub-cooling on a system utilizing test equipment (such as thermometers and gages).
22.0	Assist in the installation of a residential heating and air-conditioning system and determine start-up procedures--The student will be able to:
22.01	Read and comply with dispatch orders.
22.02	Explain local codes and ordinances.
22.03	Select and use appropriate tools and safety practices to test equipment.
22.04	Determine the electrical requirements of equipment.
22.05	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.
22.06	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.
22.07	Determine the temperature split/ difference across the evaporator.
22.08	Determine the temperature split/ difference across the condenser.
22.09	Write a service report.

22.10	Apply good customer-relations skills.
23.0	Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems--The student will be able to:
23.01	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.
23.02	Determine the start-up and checkout procedures recommended by different manufacturers.
23.03	Determine the electrical requirements of equipment.
23.04	Select and use appropriate tools, instruments and test equipment following safety precautions.
23.05	Determine the temperature split/ difference across the outdoor coil on a heat pump.
23.06	Determine the temperature split/ difference across the indoor coil on a heat pump.
23.07	Apply good customer-relations skills.
24.0	Demonstrate a working knowledge of refrigerants and oils--The student will be able to:
24.01	Identify the refrigerants in common use and state the types of applications in which each is used.
24.02	Explain the effects of releasing refrigerants into the atmosphere.
24.03	Explain how refrigerants are classified by their chemical composition.
24.04	Describe the color-coding scheme used to identify refrigerant cylinders.
24.05	Describe how azeotropes and near-azeotropes differ from each other and from so-called pure refrigerants.
24.06	Interpret a P-T chart for pure refrigerants, azeotrope, and near-azeotrope refrigerants and explain the difference between bubble point and dew point.”
24.07	Demonstrate refrigerant leak detecting methods.
24.08	Identify the different types of oils used in refrigeration systems and explain their relationships to the various refrigerants.

24.09	Explain how to add and remove oil from a system.
24.10	Describe how to test oil for contamination.
25.0	Conduct system startup and shutdown--The student will be able to:
25.01	Start up and shut down an air handler and related forced-air distribution system.
25.02	Test compressor oil for acid contamination.
25.03	Add or remove oil from a semi-hermetic or open reciprocating compressor.
26.0	Explain the importance of employability and entrepreneurship skills--The student will be able to:
26.01	Identify and demonstrate positive work behaviors needed to be employable.
26.02	Develop personal career plan that includes goals, objectives and strategies.
26.03	Examine licensing, certification and industry credentialing requirements.
26.04	Maintain a career portfolio to document knowledge, skills and experience.
26.05	Evaluate and compare employment opportunities that match career goals.
26.06	Identify and exhibit traits for retaining employment.
26.07	Identify opportunities and research requirements for career advancement.
26.08	Research the benefits of ongoing professional development.
27.0	Use combustion-type heating servicing and testing equipment--The student will be able to:
27.01	Explain combustion theory and the safety precautions for using combustion-type-heating servicing and testing equipment.
27.02	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).

27.03	Use the servicing and testing equipment.
27.04	Test, analyze and troubleshoot combustion-type-heating systems.
28.0	Troubleshoot combustion gas valves and regulators as used in heating, air-conditioning, refrigeration and ventilation systems--The student will be able to:
28.01	Identify and discuss the safety and regulation issues and concerns.
28.02	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).
28.03	Identify various types of gas valves and regulators.
28.04	Determine the application of gas valves and regulators.
28.05	Troubleshoot gas valves and regulators.
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 including a gas furnace and boiler, an oil furnace and boiler, an electric furnace, electric heaters, a heat pump and solar-heating systems.
30.0	Explain how to install, maintain and repair heating, air-conditioning and refrigeration systems--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	Explain how to lay out, construct and troubleshoot comfort systems.
30.04	Test and analyze systems.



30.05	Test and analyze heat-recovery systems.
31.0	Demonstrate knowledge of retail refrigeration systems--The student will be able to:
31.01	Describe the mechanical refrigeration cycle as it applies to retail refrigeration systems.
31.02	Explain the differences in refrigerants and applications in low-, medium- and high-temperature refrigeration systems.
31.03	Identify and describe the primary refrigeration cycle components used in retail refrigeration systems.
31.04	Identify and describe the supporting components and accessories used in retail refrigeration systems.
31.05	Describe the various methods of defrost used in retail refrigeration systems.
31.06	Identify and describe the applications for the various types of retail refrigeration systems.
31.07	Describe the control system components used in retail refrigeration systems.
31.08	Explain the operating sequence of a retail refrigeration system.
31.09	Interpret wiring diagrams and troubleshooting charts to isolate malfunctions in retail refrigeration systems.
32.0	Demonstrate knowledge of commercial and industrial refrigeration systems--The student will be able to:
32.01	Identify different types of refrigerated coolers and display cases and describe each one's common application.
32.02	Compare the basic components used in commercial/industrial refrigeration systems with those used in retail refrigeration systems.
32.03	Identify single, multiple and satellite compressor systems; describe the applications, installation considerations and advantages and disadvantages of each type.
32.04	Identify packaged condensing units and unit coolers; describe their applications, operation and installation considerations.
32.05	Identify two-stage compressors and explain their operation and applications.
32.06	Identify the various accessories used in commercial refrigeration systems and explain why each is used and where it should be installed in the system.

32.07	Identify the various refrigeration control devices and explain the purpose of each type and how it works.
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.
34.04	Discuss current issues and concerns (such as indoor-air quality, the ozone layer and computer technology) in the heating, air-conditioning and refrigeration industry and in the environment and explain their future ramifications.
34.05	Determine the properties of air, using a psychrometric chart.
34.06	Follow safety precautions.
34.07	Identify and explain the different types and benefits of air-filtration systems, air-handling systems and ventilation systems.

34.08	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	Define indoor-air quality.
36.02	Identify and explain the codes and standards regarding indoor-air quality.
36.03	Select and use indoor-air-quality measuring devices.
36.04	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.
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	Read construction documents--The student will be able to:
40.01	Recognize and identify basic construction drawing terms, components and symbols.
40.02	Relate information on construction drawings to actual locations on the print.
40.03	Recognize different classifications of construction drawings.
40.04	Interpret and use drawing dimensions.
41.0	Interpret, use and modify construction drawings and specifications--The student will be able to:
41.01	Read mechanical plans within a set of construction drawings explain their relationship.
41.02	Compare mechanical plans with the actual installation of duct and pipe runs, fittings and sections.
41.03	Interpret specification documents and apply them to the plans.
41.04	Interpret shop drawings and apply them to the plans and specifications.
41.05	Develop a field set of as-built drawings.
41.06	Identify the steps required for transferring design information to component production.

41.07	List and classify materials most commonly used in HVAC systems.
42.0	Design heating and cooling systems--The student will be able to:
42.01	Identify and describe the steps in the system design process.
42.02	Use construction drawings or an actual job site to obtain information needed to complete heating and cooling load estimates.
42.03	Identify the factors that affect heat gains and losses to a building and describe how these factors influence the design process.
42.04	Complete a load estimate to determine the heating and/or cooling load of a building.
42.05	State the principles that affect the selection of equipment to satisfy the calculated heating and/or cooling load.
42.06	Select heating and/or cooling equipment using manufacturers' product data.
42.07	Identify the various types of duct systems and explain why and where each type is used.
42.08	Demonstrate the effect of fittings and transitions on duct system design.
42.09	Use a friction loss chart and duct sizing table to size duct.
42.10	Install insulation and vapor barriers used in duct systems.
42.11	Select and install refrigerant and condensate piping following proper design principles.
43.0	Troubleshoot and repair commercial heating and air-conditioning systems--The student will be able to:
43.01	Keep a record of the installation, maintenance and repair of commercial heating and air-conditioning systems.
43.02	Apply local and national codes and safety practices.
43.03	Lay out a commercial heating and air-conditioning system.
43.04	Lay out a typical split commercial air-conditioning system.

43.05	Lay out a typical split commercial heating system.
43.06	Maintain, test, analyze and repair various types of commercial heating and air-conditioning systems.
43.07	Maintain, troubleshoot and repair water-cooled condensers
44.0	Calculate commercial heating and air-conditioning loads--The student will be able to:
44.01	Explain conduction as a heat-load source.
44.02	Describe the implications of conducting and the resistance values for different types of construction materials.
44.03	Interpret heat-transfer tables and define values U, K, C and R.
44.04	Locate the total heat-transfer value of any surface.
44.05	Explain infiltration and exfiltration/ventilation as a heat-load source.
44.06	Explain a product heat-load source.
44.07	Explain miscellaneous loads (people, motors and equipment) as heat-load sources.
44.08	Explain the purpose of vapor barriers.
44.09	Interpret tables of specific heat values as applied to commercial heating and air-conditioning systems.
44.10	Calculate and design systems.
44.11	Calculate cooling and heating equipment sizes.
44.12	Design and identify methods of installing air-movement systems.
45.0	Install air distribution systems--The student will be able to:
45.01	Describe airflow and pressures in a basic forced-air distribution system.

45.02	Explain the differences between propeller and centrifugal fans and blowers.
45.03	Identify the various types of duct systems and explain why and where each type is used.
45.04	Demonstrate or explain the installation of metal, fiberboard and flexible duct.
45.05	Demonstrate or explain the installation of fittings and transitions used in duct systems.
45.06	Identify and explain the operations of electrical control systems and their components (zone damper motors).
45.07	Demonstrate or explain the use and installation of dampers used in duct systems.
45.08	Demonstrate or explain the use and installation of insulation and vapor barriers used in duct systems.
45.09	Identify instruments used to make measurements in air systems and explain the use of each instrument.
45.10	Make basic temperature, air pressure and velocity measurements in an air distribution system.
46.0	Evaluate commercial airside systems--The student will be able to:
46.01	Identify the differences in various types of commercial all-air systems.
46.02	Identify the type of building in which a particular type of system is used.
46.03	Explain the typical range of capacities for a commercial air system.
47.0	Balance an air distribution system--The student will be able to:
47.01	Explain the fan and pump laws.
47.02	Use a psychrometric chart to evaluate air properties and changes in air properties.
47.03	Explain the principles involved in the balancing of air and water distribution systems.
47.04	Define common terms used by manufacturers when describing grilles, registers and diffusers.

47.05	Identify and use the tools and instruments needed to balance air distribution systems.
47.06	Change the speed of an air distribution system supply fan.
48.0	Select energy conservation equipment--The student will be able to:
48.01	Identify and explain the operation of energy conservation equipment.
48.02	Operate selected energy conservation equipment.
49.0	Analyze building management systems--The student will be able to:
49.01	Identify the major components of a building management system and describe how they fit together.
49.02	Explain a basic direct digital controller.
50.0	Recommend alternative heating and cooling systems for various case studies--The student will be able to:
50.01	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.
50.02	Describe alternative technologies for heating such as ductless systems, computer rooms, chilled beams and multi-zone.



## **Additional Information**

### **Laboratory Activities**

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

### **Career and Technical Student Organization (CTSO)**

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

### **Accommodations**

Federal and state legislation requires the provision of accommodations for students with disabilities 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:

Residential Air Conditioning, Refrigeration, and Heating Systems Assistant (CCC- 0615050101) – 12 Credit Hours

Residential Air Conditioning, Refrigeration, and Heating Systems Technician (CCC- 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 and 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)	49-9021 - Heating, Air Conditioning, and Refrigeration Mechanics and Installers

**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 Describe the history and concepts of heating, air-conditioning and refrigeration.
- 03.0 Explain the properties of matter and heat behavior.
- 04.0 Analyze fluids, pressures, refrigerants and related codes.
- 05.0 Evaluate heating, air-conditioning and refrigeration system components and accessories.
- 06.0 Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
- 07.0 Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing.
- 08.0 Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems.
- 09.0 Conduct system startup and shutdown.
- 10.0 Read construction documents.
- 11.0 Interpret, use and modify construction drawings and specifications.
- 12.0 Install air distribution systems.

**Florida Department of Education  
Student Performance Standards**

**Program Title:** Residential Air Conditioning, Refrigeration and Heating Systems Assistant  
**CIP Number:** 0615050101  
**Program Length:** 12 Credit Hours  
**SOC Code(s):** 49-9021

**This certificate program is part of the Air Conditioning, Refrigeration and Heating Systems 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 and use 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	Understand and apply Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), 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	Follow safety precautions when using hand and power tools.
01.12	Explain emergency procedures to follow in response to workplace accidents.
01.13	Create a disaster and/or emergency response plan.
02.0	Describe the history and concepts of heating, air-conditioning and refrigeration--The student will be able to:
02.01	Explain the basic principles of heating, ventilation and air-conditioning.

02.02	Identify and explain the four major refrigeration components.
02.03	Identify and explain the characteristics of a compression-cycle refrigerant system.
02.04	Differentiate between air-conditioning and refrigeration.
02.05	Differentiate between split systems and package systems.
02.06	Describe the benefits of conditioned air and environments.
02.07	Identify various professional organizations, associations and societies and explain their purposes.
01.01	Discuss the impact of heating, air-conditioning and refrigeration on society.
01.02	Discuss current issues and concerns (such as indoor-air quality, the ozone layer and computer technology) in the heating, air-conditioning and refrigeration industry and in the environment and explain their future ramifications.
01.03	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.
01.04	Identify various professional organizations, associations and societies and explain their purposes.
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	Analyze fluids, pressures, refrigerants and related codes--The student will be able to:
04.01	Identify the refrigeration cycle.
04.02	Identify and explain general safety issues and EPA rules and regulations regarding the handling of refrigerants.
04.03	Define and explain pressure, fluid and temperature.
04.04	Explain the standards for and ways to measure and calculate absolute and gauge pressures.

04.05	Identify and explain the classifications, properties and uses of different refrigerants.
04.06	Explain how fluids react and flow in a closed versus an open environment or vessel.
04.07	Define and identify "color-coding" of refrigerant cylinders.
04.08	Compare Pressure and Temperature (P/T) charts.
04.09	Explain the proper methods of transferring, storing and recovering refrigerants.
04.10	Explain the effects of an improper refrigerant and contaminants in a system.
05.0	Evaluate heating, air-conditioning and refrigeration system components and accessories--The student will be able to:
05.01	Explain the types, operation, use and maintenance requirements of
	a. Compressors (such as reciprocating, rotary, screw and scroll)
	b. Condensers and evaporators (such as evaporative condensers, evaporative coils, shell and tube, tube within a tube and fin and tube)
	c. Metering devices (such as adjusting automatic and thermostatic expansion valves, fixed orifices and other devices available on the local market)
05.02	Evaluate metering-device performance.
05.03	Explain the methods of compression, lubrication and compressor loading and unloading.
05.04	Analyze the operating condition of a compressor.
05.05	Test, troubleshoot and correct the causes of mechanical problems in a heating, air-conditioning and refrigeration system.
05.06	Identify the location and explain the uses of refrigerant flow accessories.
05.07	Identify the location and explain the uses of heating, air-conditioning and refrigeration-system accessories (such as receivers, dryers/filters, solenoid valves, heat exchangers, accumulators, suction filter, oil separators, evaporator pressure-regulating valve, crankcase pressure-regulating valves, hot gas bypass valves and check valves).
05.08	Evaluate system performance.
06.0	Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry--The student will be able to:
06.01	Identify and explain the purpose of the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
06.02	Bend tubing, using tube benders.
06.03	Connect tubing using flared fittings and compression fittings.

06.04	Connect tubing, using solderless connectors.
06.05	Connect tubing, using a swaged-joint connection.
06.06	Identify and use various types of torches.
06.07	Identify, select and use appropriate brazing alloys, materials and skills.
06.08	Explain the purposes and procedures for protecting piping materials and fabrication, such as valves, fittings and products from heat.
06.09	Braze tubing.
06.10	Silver-braze brass, steels and copper.
06.11	Demonstrate an understanding of the procedures for installing pipe and tubing insulation.
06.12	Explain the procedures required for installing heating, air-conditioning, refrigerant and ventilation accessories.
06.13	Fabricate and leak-test the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
06.14	Demonstrate proper safety measures when fabricating and servicing piping, tubing and fittings.
07.0	Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing--The student will be able to:
07.01	Identify and explain various types of heating, air-conditioning and refrigeration piping.
07.02	Identify basic principles of sizing various heating, air conditioning, refrigeration and ventilation for various tasks.
07.03	Explain pressure and temperature drops.
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 electrical requirements of equipment.
08.04	Select and use appropriate tools, instruments and test equipment following safety precautions.
08.05	Determine the temperature split/ difference across the outdoor coil on a heat pump.
08.06	Determine the temperature split/ difference across the indoor coil on a heat pump.
08.07	Apply good customer-relations skills.

02.0	Interpret, use and modify construction drawings and specifications--The student will be able to:
02.01	Read mechanical plans within a set of construction drawings explain their relationship.
02.02	Compare mechanical plans with the actual installation of duct and pipe runs, fittings and sections.
02.03	Interpret specification documents and apply them to the plans.
02.04	Interpret shop drawings and apply them to the plans and specifications.
02.05	Develop a field set of as-built drawings.
02.06	Identify the steps required for transferring design information to component production.
02.07	List and classify materials most commonly used in HVAC systems.
09.0	Conduct system startup and shutdown--The student will be able to:
09.01	Start up and shut down an air handler and related forced-air distribution system.
09.02	Test compressor oil for acid contamination.
09.03	Add or remove oil from a semi-hermetic or open reciprocating compressor.
10.0	Read construction documents--The student will be able to:
10.01	Recognize and identify basic construction drawing terms, components and symbols.
10.02	Relate information on construction drawings to actual locations on the print.
10.03	Recognize different classifications of construction drawings.
10.04	Interpret and use drawing dimensions.
11.0	Interpret, use and modify construction drawings and specifications--The student will be able to:
11.01	Read mechanical plans within a set of construction drawings explain their relationship.
11.02	Compare mechanical plans with the actual installation of duct and pipe runs, fittings and sections.
11.03	Interpret specification documents and apply them to the plans.
11.04	Interpret shop drawings and apply them to the plans and specifications.
11.05	Develop a field set of as-built drawings.



11.06	Identify the steps required for transferring design information to component production.
11.07	List and classify materials most commonly used in HVAC systems.
12.0	Install air distribution systems--The student will be able to:
12.01	Describe airflow and pressures in a basic forced-air distribution system.
12.02	Explain the differences between propeller and centrifugal fans and blowers.
12.03	Identify the various types of duct systems and explain why and where each type is used.
12.04	Demonstrate or explain the installation of metal, fiberboard and flexible duct.
12.05	Demonstrate or explain the installation of fittings and transitions used in duct systems.
12.06	Identify and explain the operations of electrical control systems and their components (zone damper motors).
12.07	Demonstrate or explain the use and installation of dampers used in duct systems.
12.08	Demonstrate or explain the use and installation of insulation and vapor barriers used in duct systems.
12.09	Identify instruments used to make measurements in air systems and explain the use of each instrument.
12.10	Make basic temperature, air pressure and velocity measurements in an air distribution system.

## **Additional Information**

### **Laboratory Activities**

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

### **Career and Technical Student Organization (CTSO)**

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

### **Accommodations**

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

Florida Department of Education  
Curriculum Framework

**Program Title:** Residential Air Conditioning, Refrigeration and 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)	49-9021 - Heating, Air Conditioning, and Refrigeration Mechanics and Installers

**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 Analyze fluids, pressures, refrigerants and related codes.
- 03.0 Evaluate heating, air-conditioning and refrigeration system components and accessories.
- 04.0 Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
- 05.0 Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing.
- 06.0 Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems.
- 07.0 Conduct system startup and shutdown.
- 08.0 Use combustion-type heating servicing and testing equipment.
- 09.0 Explain the standards for and ways to measure indoor-air quality.
- 10.0 (Optional) Maintain and repair thermal storage systems.
- 11.0 Read construction documents.
- 12.0 Interpret, use and modify construction drawings and specifications.
- 13.0 Design heating and cooling systems.
- 14.0 Install air distribution systems.
- 15.0 Evaluate commercial airside systems.
- 16.0 Balance an air distribution system.
- 17.0 Select energy conservation equipment.
- 18.0 Analyze building management systems.

**Florida Department of Education  
Student Performance Standards**

**Program Title:** Residential Air Conditioning, Refrigeration and Heating Systems Technician  
**CIP Number:** 0615050102  
**Program Length:** 24 Credit Hours  
**SOC Code(s):** 49-9021

**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 and use 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	Understand and apply Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), 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	Follow safety precautions when using hand and power tools.
01.12	Explain emergency procedures to follow in response to workplace accidents.
01.13	Create a disaster and/or emergency response plan.
02.0	Analyze fluids, pressures, refrigerants and related codes--The student will be able to:
02.01	Identify the refrigeration cycle.

02.02	Identify and explain general safety issues and EPA rules and regulations regarding the handling of refrigerants.
02.03	Define and explain pressure, fluid and temperature.
02.04	Explain the standards for and ways to measure and calculate absolute and gauge pressures.
02.05	Identify and explain the classifications, properties and uses of different refrigerants.
02.06	Explain how fluids react and flow in a closed versus an open environment or vessel.
02.07	Define and identify "color-coding" of refrigerant cylinders.
02.08	Compare Pressure and Temperature (P/T) charts.
02.09	Explain the proper methods of transferring, storing and recovering refrigerants.
02.10	Explain the effects of an improper refrigerant and contaminants in a system.
03.0	Evaluate heating, air-conditioning and refrigeration system components and accessories--The student will be able to:
03.01	Explain the types, operation, use and maintenance requirements of
	a. Compressors (such as reciprocating, rotary, screw and scroll)
	b. Condensers and evaporators (such as evaporative condensers, evaporative coils, shell and tube, tube within a tube and fin and tube)
	c. Metering devices (such as adjusting automatic and thermostatic expansion valves, fixed orifices and other devices available on the local market)
03.02	Evaluate metering-device performance.
03.03	Explain the methods of compression, lubrication and compressor loading and unloading.
03.04	Analyze the operating condition of a compressor.
03.05	Test, troubleshoot and correct the causes of mechanical problems in a heating, air-conditioning and refrigeration system.
03.06	Identify the location and explain the uses of refrigerant flow accessories.
03.07	Identify the location and explain the uses of heating, air-conditioning and refrigeration-system accessories (such as receivers, dryers/filters, solenoid valves, heat exchangers, accumulators, suction filter, oil separators, evaporator pressure-regulating valve, crankcase pressure-regulating valves, hot gas bypass valves and check valves).
03.08	Evaluate system performance.
04.0	Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry--The student will be able to:

04.01	Identify and explain the purpose of the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
04.02	Bend tubing, using tube benders.
04.03	Connect tubing using flared fittings and compression fittings.
04.04	Connect tubing, using solderless connectors.
04.05	Connect tubing, using a swaged-joint connection.
04.06	Identify and use various types of torches.
04.07	Identify, select and use appropriate brazing alloys, materials and skills.
04.08	Explain the purposes and procedures for protecting piping materials and fabrication, such as valves, fittings and products from heat.
04.09	Braze tubing.
04.10	Silver-braze brass, steels and copper.
04.11	Demonstrate an understanding of the procedures for installing pipe and tubing insulation.
04.12	Explain the procedures required for installing heating, air-conditioning, refrigerant and ventilation accessories.
04.13	Fabricate and leak-test the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
04.14	Demonstrate proper safety measures when fabricating and servicing piping, tubing and fittings.
05.0	Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing--The student will be able to:
05.01	Identify and explain various types of heating, air-conditioning and refrigeration piping.
05.02	Identify basic principles of sizing various heating, air conditioning, refrigeration and ventilation for various tasks.
05.03	Explain pressure and temperature drops.
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 electrical requirements of equipment.
06.04	Select and use appropriate tools, instruments and test equipment following safety precautions.

06.05	Determine the temperature split/ difference across the outdoor coil on a heat pump.
06.06	Determine the temperature split/ difference across the indoor coil on a heat pump.
06.07	Apply good customer-relations skills.
07.0	Conduct system startup and shutdown--The student will be able to:
07.01	Start up and shut down an air handler and related forced-air distribution system.
07.02	Test compressor oil for acid contamination.
07.03	Add or remove oil from a semi-hermetic or open reciprocating compressor.
08.0	Use combustion-type heating servicing and testing equipment--The student will be able to:
08.01	Explain combustion theory and the safety precautions for using combustion-type-heating servicing and testing equipment.
08.02	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).
08.03	Use the servicing and testing equipment.
08.04	Test, analyze and troubleshoot combustion-type-heating systems.
09.0	Explain the standards for and ways to measure indoor-air quality--The student will be able to:
09.01	Define indoor-air quality.
09.02	Identify and explain the codes and standards regarding indoor-air quality.
09.03	Select and use indoor-air-quality measuring devices.
09.04	Explain the standards for and ways to measure indoor-air quality using various methods.
10.0	(Optional) Maintain and repair thermal storage systems --The student will be able to:
10.01	Apply appropriate codes, standards and safety practices.
10.02	Describe the benefits and limitations of each type.
10.03	Explain the operational principles of a thermal storage system.
10.04	Identify and explain various types of thermal storage systems.
10.05	Troubleshoot and test various types of thermal storage systems.



11.0	Read construction documents--The student will be able to:
11.01	Recognize and identify basic construction drawing terms, components and symbols.
11.02	Relate information on construction drawings to actual locations on the print.
11.03	Recognize different classifications of construction drawings.
11.04	Interpret and use drawing dimensions.
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	Design heating and cooling systems--The student will be able to:
13.01	Identify and describe the steps in the system design process.
13.02	Use construction drawings or an actual job site to obtain information needed to complete heating and cooling load estimates.
13.03	Identify the factors that affect heat gains and losses to a building and describe how these factors influence the design process.
13.04	Complete a load estimate to determine the heating and/or cooling load of a building.
13.05	State the principles that affect the selection of equipment to satisfy the calculated heating and/or cooling load.
13.06	Select heating and/or cooling equipment using manufacturers' product data.
13.07	Identify the various types of duct systems and explain why and where each type is used.
13.08	Demonstrate the effect of fittings and transitions on duct system design.
13.09	Use a friction loss chart and duct sizing table to size duct.

13.10	Install insulation and vapor barriers used in duct systems.
13.11	Select and install refrigerant and condensate piping following proper design principles.
14.0	Install air distribution systems--The student will be able to:
14.01	Describe airflow and pressures in a basic forced-air distribution system.
14.02	Explain the differences between propeller and centrifugal fans and blowers.
14.03	Identify the various types of duct systems and explain why and where each type is used.
14.04	Demonstrate or explain the installation of metal, fiberboard and flexible duct.
14.05	Demonstrate or explain the installation of fittings and transitions used in duct systems.
14.06	Identify and explain the operations of electrical control systems and their components (zone damper motors).
14.07	Demonstrate or explain the use and installation of dampers used in duct systems.
14.08	Demonstrate or explain the use and installation of insulation and vapor barriers used in duct systems.
14.09	Identify instruments used to make measurements in air systems and explain the use of each instrument.
14.10	Make basic temperature, air pressure and velocity measurements in an air distribution system.
15.0	Evaluate commercial airside systems--The student will be able to:
15.01	Identify the differences in various types of commercial all-air systems.
15.02	Identify the type of building in which a particular type of system is used.
15.03	Explain the typical range of capacities for a commercial air system.
16.0	Balance an air distribution system--The student will be able to:
16.01	Explain the fan and pump laws.
16.02	Use a psychrometric chart to evaluate air properties and changes in air properties.
16.03	Explain the principles involved in the balancing of air and water distribution systems.
16.04	Define common terms used by manufacturers when describing grilles, registers and diffusers.
16.05	Identify and use the tools and instruments needed to balance air distribution systems.

16.06	Change the speed of an air distribution system supply fan.
17.0	Select energy conservation equipment--The student will be able to:
17.01	Identify and explain the operation of energy conservation equipment.
17.02	Operate selected energy conservation equipment.
18.0	Analyze building management systems--The student will be able to:
18.01	Identify the major components of a building management system and describe how they fit together.
18.02	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 intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

### **Accommodations**

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

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)	11-9021 - Construction Managers

**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 (60) 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.
- 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 Interpret basic designs and apply construction principles.
- 05.0 Take off quantities and estimate costs.
- 06.0 Plan, coordinate, schedule and control projects.
- 07.0 Understand various tests and inspections.
- 08.0 Demonstrate efficient office procedures.
- 09.0 Demonstrate appropriate math skills.
- 10.0 Demonstrate appropriate understanding of basic science.
- 11.0 Demonstrate employability skills.

Florida Department of Education  
Student Performance Standards

**Program Title:** Building Construction Specialist  
**CIP Number:** 0615100103  
**Program Length:** 18 Credit Hours  
**SOC Code(s):** 11-9021

**This certificate program is part of the Building Construction Technology (60) AS degree program (1615100102). At the completion of this program, the student will be able to:**

01.0	Communicate effectively--The student will be able to:
01.01	Prepare business correspondence.
01.02	Prepare daily project report.
01.03	Prepare requisitions for equipment and materials.
01.04	Prepare minutes from job-site meetings.
01.05	Write logical and understandable statements or phrases to accurately fill out forms/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 and oral 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.
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 structural drawings and specifications.
03.03	Interpret reinforcing steel drawings and bar list and placement.

03.04	Verify compliance with ASTM standards.
03.05	Evaluate shop drawings prior to review by architect or engineer of record.
04.0	Interpret basic designs and apply construction principles--The student will be able to:
04.01	Plan and coordinate site clearing and preparation, excavation and foundation work.
04.02	Coordinate concrete and formwork.
04.03	Coordinate staging and scaffolding.
04.04	Coordinate the erection of walls with the rough opening sizes for windows and doors.
04.05	Coordinate masonry work.
04.06	Coordinate the proper selection and installation of various roofing materials.
04.07	Coordinate the selections and installations of miscellaneous metal.
04.08	Coordinate structural steel work.
04.09	Coordinate mechanical work.
04.10	Coordinate elevator installation.
04.11	Coordinate electrical and lighting installation.
04.12	Coordinate the installation of lath, plaster and dry wall.
04.13	Coordinate painting and finishes.
04.14	Coordinate the installation tile and terrazzo.
04.15	Coordinate the installation of finish flooring.
04.16	Coordinate the installation of rough and finish carpentry.
05.0	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.
05.07	Summarize project cost and complete tenders prices.
06.0	Plan, coordinate, schedule and control projects--The student will be able to:
06.01	Prepare daily time sheets and daily logs.
06.02	Record and control materials received.
06.03	Allocate efficient use of site space.
06.04	Maintain a clean and orderly construction site.
06.05	Understand the handling and storage requirements of different materials and equipment for loss prevention and jobsite safety.
06.06	Coordinate and control use of construction tools and equipment.
06.07	Develop a schedule of values and prepare progress billing.
06.08	Prepare work schedules.
06.09	Prepare material delivery schedules.
06.10	Expedite delivery of manufactured materials.
06.11	Analyze productivity.
06.12	Record deficiencies as a result of project inspections.
06.13	Prepare coded cost break downs.
06.14	Take appropriate action to correct project deficiencies.
06.15	Monitor schedule to control project.
06.16	Prepare cost reports.
07.0	Understand various tests and inspections--The student will be able to:
07.01	Know when to call building inspection department for signoff on required phases of construction permit progress.

07.02	Know when to call third party verifiers to test and/ or verify compliance at required phases or stages of construction for certifications.
08.0	Demonstrate efficient office procedures--The student will be able to:
08.01	Organize work area both in office and field.
08.02	Select and use appropriate forms and computer software.
08.03	Develop and maintain filing system.
08.04	Maintain inventory of physical assets.
08.05	Set up and maintain technical reference library.
08.06	Maintain a system for field work authorizations.
08.07	Maintain a system for back charges and change orders.
08.08	Interpret basic company accounting procedures.
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 tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
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 appropriate understanding of basic science--The student will be able to:
10.01	Understand the practical application of molecular action as a result of temperature extremes, chemical reaction and moisture content.
10.02	Draw conclusions or make inferences from data.
10.03	Understand pressure measurement in terms of PSI.
11.0	Demonstrate employability skills--The student will be able to:
11.01	Understand the process of conducting a job search for employment.
11.02	Secure information about a job.

11.03 Obtain and compile documents which may be required when applying for a job interview.

11.04 Complete a job application and submit it.

11.05 Demonstrate competence in job interview techniques.

11.06 Identify or demonstrate appropriate responses to criticism in the workplace.

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

### **Accommodations**

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

Florida Department of Education  
Curriculum Framework

**Program Title:** Green Building Construction Technology  
**Career Cluster:** Architecture and Construction

CCC	
CIP Number	0615100104
Program Type	College Credit Certificate (CCC)
Program Length	24 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	11-9021 - Construction Managers

**Purpose**

This certificate program is part of the Building Construction Technology AS (60) 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.

The content includes but is not limited to communication skills, math skills, human relations and employability skills, safe and efficient construction practices, building materials, interpreting plans, and estimating and planning of residential and commercial structures. **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.
- 02.0 Identify appropriate grade, quality, use, and selection of building materials, and methods of construction. Produce, read and interpret drawings and specifications.
- 03.0 Draw, read and interpret drawings and specifications.
- 04.0 Interpret basic designs and apply sound construction principles.
- 05.0 Take off quantities and estimate costs.
- 06.0 Plan, coordinate, schedule and control projects.
- 07.0 Understand various tests and inspections.
- 08.0 Demonstrate appropriate math skills.
- 09.0 Demonstrate appropriate understanding of basic science.
- 10.0 Demonstrate employability skills.

Florida Department of Education  
Student Performance Standards

**Program Title:** Green Building Construction Technology  
**CIP Number:** 0615100104  
**Program Length:** 24 Credit Hours  
**SOC Code(s):** 11-9021

**This certificate program is part of the Building Construction Technology AS (60) degree program (1615100102). At the completion of this program, the student will be able to:**

01.0	Communicate effectively--The student will be able to:
01.01	Prepare business correspondence.
01.02	Prepare daily project report.
01.03	Prepare requisitions for equipment and materials.
01.04	Prepare minutes from job-site meetings.
01.05	Write logical and understandable statements or phrases to accurately fill out forms/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 and oral 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.
03.0	Draw, read and interpret drawings and specifications--The student will be able to:
03.01	Identify, select and use manual and 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	Evaluate shop drawings prior to review by architect or engineer of record.
03.14	Interpret mechanical drawings and specifications.
03.15	Interpret electrical drawings and specifications.
04.0	Interpret basic designs and apply construction principles--The student will be able to:
04.01	Plan and coordinate site clearing and preparation, excavation and foundation work.
04.02	Coordinate and supervise concrete and formwork.
04.03	Coordinate and supervise staging and scaffolding.
04.04	Coordinate and supervise the erection of walls with the rough opening sizes for windows and doors.
04.05	Coordinate and supervise masonry work.
04.06	Coordinate and supervise the proper selection and installation of various roofing materials.
04.07	Coordinate and supervise the selections and installations of miscellaneous metal.
04.08	Coordinate and supervise structural steel work.
04.09	Coordinate and supervise mechanical work.
04.10	Coordinate and supervise electrical and lighting installation.



04.11	Coordinate and supervise the installation of lath, plaster and dry wall.
04.12	Coordinate and supervise painting and finishes.
04.13	Coordinate and supervise the installation of tile and terrazzo.
04.14	Coordinate and supervise the installation of finish flooring.
04.15	Coordinate and supervise the installation of rough and finish carpentry.
05.0	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.
05.07	Summarize project cost and complete tenders prices.
05.08	Determine testing requirements based on architectural and engineering plans and specifications.
06.0	Plan, coordinate, schedule and control projects--The student will be able to:
06.01	Prepare daily time sheets and daily logs.
06.02	Record and control materials received.
06.03	Allocate efficient use of site space.
06.04	Maintain a clean and orderly construction site.
06.05	Understand the handling and storage requirements of different materials and equipment for loss prevention and jobsite safety.
06.06	Coordinate and control use of construction tools and equipment.
06.07	Develop a schedule of values and prepare progress billing.
06.08	Prepare work schedules.

06.09	Prepare material delivery schedules.
06.10	Expedite delivery of manufactured materials.
06.11	Analyze productivity.
06.12	Record deficiencies as a result of project inspections.
06.13	Prepare coded cost break downs.
06.14	Take appropriate action to correct project deficiencies.
06.15	Monitor schedule to control project.
06.16	Prepare cost reports.
07.0	Understand various tests and inspections--The student will be able to:
07.01	Know when to call building inspection department for signoff on required phases of construction permit progress.
07.02	Know when to call third party verifiers to test and/ or verify compliance at required phases or stages of construction for certifications.
08.0	Demonstrate appropriate math skills--The student will be able to:
08.01	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares and cylinders.
08.02	Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
08.03	Add, subtract, multiply and divide using fractions, decimals and whole numbers.
08.04	Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
08.05	Demonstrate an understanding of federal, state and local taxes and their computation.
08.06	Understand unemployment, workers' 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.
09.0	Demonstrate appropriate understanding of basic science--The student will be able to:
09.01	Understand the practical application of molecular action as a result of temperature extremes, chemical reaction and moisture content.
09.02	Draw conclusions or make inferences from data.
09.03	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.
09.04	Understand pressure measurement in terms of PSI.

10.0	Demonstrate employability skills--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 a job application and submit it.
10.05	Demonstrate competence in job interview techniques.
10.06	Identify or demonstrate appropriate responses to criticism in the workplace.
10.07	Identify acceptable 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 intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

### **Accommodations**

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

Florida Department of Education  
Curriculum Framework

**Program Title:** Drafting Design  
**Career Cluster:** Architecture and Construction

CCC	
CIP Number	0615130101
Program Type	College Credit Certificate (CCC)
Program Length	22 Credit Hours (Primary), 24 Credit Hours (Secondary)
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3011 – Architectural and Civil Drafters

**Purpose**

The purpose of this program is to prepare students for employment as construction planners, or to provide supplemental training for persons previously or currently employed in these occupations.

This certificate program is part of the Drafting and Design Technology AS degree program (1615130102).

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, 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 Apply basic drafting skills.
- 08.0 Apply technical mathematics.
- 09.0 Prepare architectural drawings.
- 10.0 Prepare computer aided drawings.

Florida Department of Education  
Student Performance Standards

**Program Title:** Drafting Design  
**CIP Number:** 0615130101  
**Program Length:** 22 Credit Hours  
**SOC Code(s):** 17-3011

**This certificate program is part of the Drafting and Design Technology AS degree program (1615020200). At the completion of this program, the student will be able to:**

01.0 Apply basic drafting skills--The student will be able to:

01.01 Apply safety practices.

01.02 Operate drafting instruments.

01.03 Perform lettering techniques.

01.04 Prepare multi-view drawings.

01.05 Prepare sectional views.

01.06 Prepare auxiliary views.

01.07 Prepare dimension drawings.

01.08 Prepare pictorial drawings.

01.09 Prepare sketches.

01.10 Prepare title blocks and other formats.

01.11 Compile a portfolio.

08.0 Apply technical mathematics--The student will be able to:

08.01 Solve arithmetic problems.

08.02 Solve algebra problems.

08.03 Solve geometry problems.

09.0 Prepare architectural drawings--The student will be able to:

09.01	Prepare floor plan drawings.
09.02	Prepare foundation plan and detail drawings.
09.03	Prepare elevation drawings.
09.04	Prepare landscape layouts.
09.05	Prepare schedules.
09.06	Prepare sections.
09.08	Prepare truss drawings.
09.09	Prepare stairway drawings.
09.10	Prepare fireplace drawings.
09.11	Prepare plot plan drawings.
09.12	Prepare plumbing plan drawings.
09.13	Prepare climate control drawings.
09.14	Prepare electrical plan drawings.
10.0	Prepare computer aided drawings--The student will a able to:
10.01	Use system commands.
10.02	Perform drafting procedures.
10.03	Operate peripheral equipment.
10.04	Apply specialized computer aided drafting (CAD) functions.



## **Additional Information**

### **Laboratory Activities**

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

### **Career and Technical Student Organization (CTSO)**

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

### **Accommodations**

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

Florida Department of Education  
Curriculum Framework

**Program Title:** AutoCAD Foundations  
**Career Cluster:** Architecture and Construction

CCC	
CIP Number	0615130204
Program Type	College Credit Certificate (CCC)
Program Length	14 Credit Hours (Primary), 15 Credit Hours (Secondary)
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3011 – Architectural and Civil Drafters

**Purpose**

The purpose of this program is to prepare students for employment as drafters or chief design drafters, or to provide supplemental training for persons previously or currently employed in these occupations. The training will be technologically advanced, thus meeting the current needs of the industry.

This certificate program is part of the Drafting and Design Technology AS degree program (1615130102).

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, safe and efficient work practices, drafting standards, math skills, and drafting office practices to assist mathematical, electrical and electronic, architectural, chemical, civil, or other engineers in the design and drafting of electrical circuits, machines, structures, weldments, or architectural plans. It also includes instruction in the preparation of engineering plans, layouts, and detailed drawings according to conventional projection principles, preparation of charts, graphs or diagrams, and the use of handbook data germane to design and drafting in various fields.

**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 basic drafting skills.
- 08.0 Apply technical mathematics.
- 09.0 Prepare architectural drawings.
- 10.0 Prepare computer aided drawings.

Florida Department of Education  
Student Performance Standards

Program Title: AutoCAD Foundations  
 CIP Number: 0615130204  
 Program Length: 14 Credit Hours  
 SOC Code(s): 17-3011

**This certificate program is part of the Drafting and Design Technology AS degree program (1615130102). At the completion of this program, the student will be able to:**

01.0	Apply basic drafting skills--The student will be able to:
01.01	Apply safety practices.
01.02	Operate drafting instruments.
01.03	Perform lettering techniques.
01.04	Prepare multi-view drawings.
01.05	Prepare sectional views.
01.06	Prepare auxiliary views.
01.07	Prepare dimension drawings.
01.08	Prepare pictorial drawings.
01.09	Prepare sketches.
01.10	Prepare title blocks and other formats.
01.11	Compile a portfolio.
08.0	Apply technical mathematics--The student will be able to:
08.01	Solve arithmetic problems.
08.02	Solve algebra problems.
08.03	Solve geometry problems.
09.0	Prepare architectural drawings--The student will be able to:

09.01	Prepare floor plan drawings.
09.02	Prepare foundation plan and detail drawings.
09.03	Prepare elevation drawings.
09.04	Prepare landscape layouts.
09.05	Prepare schedules.
09.06	Prepare sections.
09.07	Prepare truss drawings.
09.08	Prepare stairway drawings.
09.09	Prepare fireplace drawings.
09.10	Prepare plot plan drawings.
09.11	Prepare plumbing plan drawings.
09.12	Prepare climate control drawings.
09.13	Prepare electrical plan drawings.
10.0	Prepare computer aided drawings--The student will a able to:
10.01	Operate computer in networked environment.
10.02	Use system commands.
10.03	Perform drafting procedures.
10.04	Operate peripheral equipment.
10.05	Apply specialized computer aided drafting (CAD) functions.

## **Additional Information**

### **Laboratory Activities**

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

### **Career and Technical Student Organization (CTSO)**

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

### **Accommodations**

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

Florida Department of Education  
Curriculum Framework

**Program Title:** Sustainable Design  
**Career Cluster:** Architectural Construction

CCC	
CIP Number	0630330106
Program Type	College Credit Certificate (CCC)
Program Length	19 Credit Hours
CTSO	Skills USA
SOC Codes (all applicable)	17-3011 – Architectural and Civil Drafters

**Purpose**

The purpose of this program is to prepare students for employment as construction planners, or to provide supplemental training for persons previously or currently employed in these occupations.

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.).

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, 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 Communicate effectively.
- 02.0 Identify, select, apply and maintain drafting and graphic materials and equipment, including both table top and Computer Aided Drafting (CAD).
- 03.0 Identify construction materials and their application.
- 04.0 Interpret drawings and documents.
- 05.0 Interpret and apply basic principles of architectural and engineering design.
- 06.0 Interpret and apply codes, regulations and technical literature.
- 07.0 Produce architectural working drawings using both table top and Computer Aided Drafting (CAD).
- 08.0 Prepare subcontractor shop drawings using both table top and Computer Aided Drafting (CAD).
- 09.0 Estimate basic quantities of materials.
- 10.0 Demonstrate appropriate communication skills.
- 11.0 Demonstrate appropriate math skills.
- 12.0 Explain 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  
**SOC Code(s):** 17-3011

**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	Communicate effectively--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 relationship with others.
01.04	Prepare business correspondence, memos and reports.
01.05	Compose clear and concise oral and written technical reports and presentations.
01.06	Participate in technical discussion and meetings.
02.0	Identify, select, apply and maintain drafting and graphic materials and equipment, including both table top 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 tools (triangles, compass, etc.) 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 machine, T square and parallel rule.
02.06	Identify, select and apply color markers and pencils.
02.07	Operate calculators.
02.08	Identify, operate and maintain photography equipment.

02.09	Apply photographic techniques.
02.10	Apply and develop lettering and drawing techniques.
03.0	Identify construction materials and their application -- The student will be able to:
01.01	Identify paving materials and applications.
01.02	Identify formwork materials and methods.
01.03	Identify concrete materials and applications.
01.04	Identify reinforcing steel and applications.
01.05	Identify masonry materials and applications.
01.06	Identify structural steel shapes and applications.
01.07	Identify miscellaneous metals and applications.
01.08	Identify wood construction materials and applications.
01.09	Identify millwork, finished carpentry and trim, cabinets, etc. and applications.
01.10	Identify adhesives and sealants and applications.
01.11	Identify plastic materials and applications.
01.12	Identify waterproofing materials and vapor barriers and applications.
01.13	Identify insulation materials and applications.
01.14	Identify roofing materials and applications.
01.15	Identify flashings and applications.
01.16	Identify glass and glazing materials and applications.
01.17	Identify exterior finishes and applications.
01.18	Identify floor finish materials and applications.
01.19	Identify wall finish materials and applications.
01.20	Identify ceiling finish materials and applications.

01.21	Identify fire proofing materials and applications.
01.22	Identify finish hardware and applications.
01.23	Identify manufactured specialties and applications.
01.24	Identify applications of pre-engineered and prefabricated structures.
01.25	Identify basic plumbing components.
01.26	Identify basic HVAC components.
01.27	Identify basic electrical components.
04.0	Interpret 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 specifications.
04.07	Interpret addendums.
04.08	Interpret shop drawings.
04.09	Interpret mechanical drawings.
04.10	Interpret electrical drawings.
04.11	Interpret master and development plans and documents.
05.0	Interpret and apply basic principles of architectural and engineering design -- The student will be able to:
05.01	Interpret soil analysis reports.
05.02	Interpret compaction test reports.
05.03	Interpret and apply fundamentals of site requirements.

05.04	Determine and apply space relationships.
06.0	Interpret and apply codes, regulations and technical literature -- The student will be able to:
06.01	Use appropriate time-saving reference materials.
06.02	Interpret and apply local, state, national and international building codes including the Florida Building Codes, the Life Safety Code (NFPA 101), the National Electric Code (NFPA 70 ), the International Building Code (IBC), etc.
06.03	Interpret and apply municipal codes and regulations.
06.04	Interpret zoning bylaws and regulations.
06.05	Interpret zoning maps.
06.06	Read and interpret trade magazines and catalogs.
06.07	Read and interpret trade manuals.
06.08	Interpret yardstick costing manual.
06.09	Interpret and apply construction association regulations.
07.0	Produce architectural working drawings using both table top and Computer Aided Drafting (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 schedules.
07.05	Prepare sections.
07.06	Build architectural models.
07.07	Prepare plot plan drawings.
08.0	Prepare subcontractor shop drawings using both table top and Computer Aided Drafting (CAD)-- The student will be able to:
08.01	Prepare plumbing plan drawings.
08.02	Prepare climate control drawings.
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.
10.0	Demonstrate appropriate communication skills -- The student will be able to:
10.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
10.02	Read and understand graphs, charts, diagrams and tables commonly used in this industry/occupation area.
10.03	Read and follow written and oral instructions.
10.04	Answer and ask questions coherently and concisely.
10.05	Read critically by recognizing assumptions and implications and by evaluating ideas.
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	Add, subtract, multiply and divide using fractions, decimals and whole numbers.
11.03	Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
12.0	Explain sustainability issues related to the design, construction and maintenance of the built environment--The student will be able to:
12.01	Describe the impact of the construction industry on the natural environment.
12.02	Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.
12.03	Identify and analyze sustainable alternatives to conventional construction practices.

12.04 Identify specific practices that can lessen adverse impacts on the environment.

12.05 Describe the building assessment tools such as Leadership in Energy and Environmental Design (LEED) and Green Globes.

12.06 Identify design features, construction activities 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 intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

### **Accommodations**

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



Florida Department of Education  
Curriculum Framework

**Program Title:** Architectural Design and Construction Technology  
**Career Cluster:** Architecture and Construction

**AS**

CIP Number	1604090100
Program Type	College Credit
Standard Length	66 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3011 – Architectural and Civil Drafters

**Purpose**

The purpose of this program is to prepare students for employment as construction planners, 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, 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 Communicate effectively.
- 02.0 Identify, select, apply and maintain drafting and graphic materials and equipment, including both table top and Computer Aided Drafting (CAD).
- 03.0 Identify construction materials and their application.
- 04.0 Interpret drawings and documents.
- 05.0 Interpret and apply basic principles of architectural and engineering design.
- 06.0 Interpret and apply codes, regulations and technical literature.
- 07.0 Produce architectural working drawings using both table top and Computer Aided Drafting (CAD).
- 08.0 Produce structural drawings using both table top and Computer Aided Drafting (CAD) for steel and concrete structures.
- 09.0 Prepare subcontractor shop drawings using both table top and Computer Aided Drafting (CAD).
- 10.0 Survey and assess construction sites.
- 11.0 Estimate basic quantities of materials.
- 12.0 Perform office and administrative procedures.
- 13.0 Demonstrate appropriate communication skills.
- 14.0 Demonstrate appropriate math skills.
- 15.0 Demonstrate appropriate understanding of basic science.
- 16.0 Demonstrate employability skills.
- 17.0 Demonstrate an understanding of entrepreneurship.
- 18.0 Explain sustainability issues related to the design, construction and maintenance of the built environment.

Florida Department of Education  
Student Performance Standards

Program Title: Architectural Design and Construction Technology  
 CIP Number: 1604090100  
 Program Length: 66 Credit Hours  
 SOC Code(s): 17-3011

**The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. At the completion of this program, the student will be able to:**

01.0	Communicate effectively--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 relationship with others.
01.04	Prepare business correspondence, memos and reports.
01.05	Use electronic communication technologies such as email, text messaging and social networking appropriately.
01.06	Compose clear and concise oral and written technical reports and presentations.
01.07	Participate in technical discussion and meetings.
02.0	Identify, select, apply and maintain drafting and graphic materials and equipment, including both table top and Computer Aided Drafting (CAD)--The student will be able to:
02.01	Apply functions of light table.
02.02	Use architectural and engineering scales.
02.03	Identify and select drawing materials.
02.04	Select, apply and maintain basic drawing instruments including both table top tools (triangles, compass, etc.) and computer hardware devices and software programs.
02.05	Identify, apply and maintain lettering instruments.
02.06	Identify and select leads, lead holders, sharpeners and erasers for table top drafting.
02.07	Identify and select reproduction materials including plotters, laser printers, inkjet printers and blueprint machines.

02.08	Identify, operate and maintain reproduction equipment including plotters, laser printers, inkjet printers and blueprint machines.
02.09	Select and apply architectural and engineering curves and templates.
02.10	Set up and maintain drafting machine, T square and parallel rule.
02.11	Identify, select and apply commercial press on graphic materials.
02.12	Operate and maintain inking equipment and materials.
02.13	Identify, select and apply color markers and pencils.
02.14	Identify, select and apply water base colors.
02.15	Select and apply scribing materials and instruments.
02.16	Operate calculators.
02.17	Measure area using planimeter.
02.18	Identify and apply metric system.
02.19	Identify, operate and maintain photography equipment.
02.20	Apply photographic techniques.
02.21	Apply and develop drawing techniques using both table top drafting and Computer-Aided Drafting (CAD).
02.22	Apply and develop freehand lettering techniques.
03.0	Identify construction materials and their application--The student will be able to:
03.01	Identify paving materials and applications.
03.02	Identify formwork materials and methods.
03.03	Identify concrete materials and applications.
03.04	Identify reinforcing steel and applications.
03.05	Identify masonry materials and applications.
03.06	Identify structural steel shapes and applications.
03.07	Identify miscellaneous metals and applications.

03.08	Identify wood construction materials and applications.
03.09	Identify millwork, finished carpentry and trim, cabinets, etc. and applications.
03.10	Identify adhesives and sealants and applications.
03.11	Identify plastic laminates and applications.
03.12	Identify waterproofing materials and vapor barriers and applications.
03.13	Identify insulation materials and applications.
03.14	Identify roofing materials and applications.
03.15	Identify flashings and applications.
03.16	Identify glass and glazing materials and applications.
03.17	Identify exterior finishes and applications.
03.18	Identify floor finish materials and applications.
03.19	Identify wall finish materials and applications.
03.20	Identify ceiling finish materials and applications.
03.21	Identify fire proofing materials and applications.
03.22	Identify finish hardware and applications.
03.23	Identify manufactured specialties and applications.
03.24	Identify applications of pre-engineered and prefabricated structures.
03.25	Identify basic plumbing components.
03.26	Identify basic HVAC components.
03.27	Identify basic electrical components.
04.0	Interpret 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 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 approach to buildings.
04.14	Identify and interpret contracts.
04.15	Identify and interpret liens.
04.16	Interpret deeds.
04.17	Interpret master and development plans and documents.
05.0	Interpret and apply basic principles of architectural and engineering design--The student will be able to:
05.01	Conduct and interpret concrete slump test.
05.02	Take test cylinder and interpret results.
05.03	Interpret soil analysis reports.
05.04	Interpret compaction test reports.
05.05	Interpret theory of loads.
05.06	Determine effect of loads on materials.
05.07	Interpret principles of expansion and contraction and control.

05.08	Interpret and apply fundamentals of site requirements.
05.09	Determine and apply space relationships.
06.0	Interpret and apply codes, regulations and technical literature--The student will be able to:
06.01	Use appropriate time-saving reference materials.
06.02	Interpret and apply local, state, national and international building codes including the Florida Building Codes, the Life Safety Code (NFPA 101), the National Electric Code (NFPA 70 ), the International Building Code (IBC), etc.
06.03	Interpret and apply municipal codes and regulations.
06.04	Interpret zoning bylaws and regulations.
06.05	Interpret zoning maps.
06.06	Read and interpret trade magazines and catalogs.
06.07	Interpret trade manuals.
06.08	Interpret regional estimating cost manuals.
06.09	Interpret and apply construction association regulations.
07.0	Produce architectural working drawings using both table top and Computer Aided Drafting (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 schedules.
07.06	Prepare sections.
07.07	Build architectural models.
07.08	Prepare truss drawings.
07.09	Prepare stairway drawings.
07.10	Prepare fireplace drawings.

	07.11 Prepare plot plan drawings.
08.0	Produce structural drawings using both table top and Computer Aided Drafting (CAD) for steel and concrete structures--The student will be able to:
	08.01 Draw beam connections.
	08.02 Draw structural assemblies.
	08.03 Prepare erection plans.
	08.04 Prepare structural drawings.
	08.05 Make take-offs from reinforced concrete engineering drawings.
	08.06 Prepare footing and foundation drawings.
	08.07 Prepare column detail drawings.
	08.08 Prepare floor and roof detail drawings.
	08.09 Prepare special structure detail drawings.
	08.10 Prepare framed beam connection drawings.
	08.11 Prepare stiffened seat connection drawings.
	08.12 Prepare bolted column detail drawings.
	08.13 Prepare gusset plate drawings.
09.0	Prepare subcontractor shop drawings using both table top and Computer Aided Drafting (CAD)--The student will be able to:
	09.01 Prepare plumbing plan drawings.
	09.02 Prepare climate control drawings.
	09.03 Prepare electrical plan drawings.
10.0	Survey and assess construction sites--The student will be able to:
	10.01 Prepare site sketches.
	10.02 Select and apply methods of on-site measuring including traditional chains and tapes and current satellite Global Positioning Systems (GPS).
	10.03 Interpret survey books, logs and electronic records including County Tax Assessor, American Land Title Association (ALTA), the United States Geological Survey (USGS), Terra Server, etc.



10.04	Identify and apply basic principles of levels and rods.
10.05	Identify and apply basic principles of transits.
10.06	Interpret angular and distance measurements to bearings and azimuth.
10.07	Outline basics of site meetings and inspection.
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.
12.0	Perform office and administrative 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	Identify basic project management systems.
12.08	Use project management and scheduling software.
13.0	Demonstrate appropriate communication skills--The student will be able to:

13.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
13.02	Read and understand graphs, charts, diagrams and tables commonly used in this industry/occupation area.
13.03	Read and follow written and oral instructions.
13.04	Answer and ask questions coherently and concisely.
13.05	Read critically by recognizing assumptions and implications and by evaluating ideas.
13.06	Demonstrate appropriate communication skills including speaking, telephone, email, social networking, etc.
14.0	Demonstrate appropriate math skills--The student will be able to:
14.01	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares and cylinders.
14.02	Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
14.03	Add, subtract, multiply and divide using fractions, decimals and whole numbers.
14.04	Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
14.05	Demonstrate an understanding of federal, state and local taxes and their computation.
15.0	Demonstrate appropriate understanding of basic science--The student will be able to:
15.01	Understand molecular action as a result of temperature extremes, chemical reaction and moisture content.
15.02	Draw conclusions or make inferences from data.
15.03	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.
15.04	Understand pressure measurement in terms of PSI, inches of mercury and KPA.
16.0	Demonstrate employability skills--The student will be able to:
16.01	Conduct a job search.
16.02	Secure information about a job.
16.03	Identify documents which may be required when applying for a job interview.
16.04	Write a resume, cover letter and fill out a typical job application form.
16.05	Demonstrate competence in job interview techniques.

16.06	Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
16.07	Identify acceptable work habits.
16.08	Demonstrate knowledge of how to make job changes appropriately.
16.09	Demonstrate acceptable employee health habits.
17.0	Demonstrate an understanding of entrepreneurship--The student will be able to:
17.01	Define entrepreneurship.
17.02	Describe the importance of entrepreneurship to the American economy.
17.03	List the advantages and disadvantages of business ownership.
17.04	Identify the risks involved in ownership of a business.
17.05	Identify the necessary personal characteristics of a successful entrepreneur.
17.06	Identify the business skills needed to operate a small business efficiently and effectively.
18.0	Explain 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	Identify and analyze sustainable alternatives to conventional construction practices.
18.04	Identify specific practices that can lessen adverse impacts on the environment.
18.05	Describe the building assessment tools such as Leadership in Energy and Environmental Design (LEED) and Green Globes.
18.06	Identify design features, construction activities 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 intercultural 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 AAS 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 (60)  
**Career Cluster:** Architecture and Construction

**AS**

CIP Number	1615100102
Program Type	College Credit
Standard Length	60 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	11-9021 - Construction Managers

**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 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 appropriate 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 (60)  
 CIP Number: 1615100102  
 Program Length: 60 Credit Hours  
 SOC Code(s): 11-9021

**The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. 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/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 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 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 insurance.
04.04	Interpret, apply and control change orders.
04.05	Interpret and apply IRC/IBC/IECC Building Codes.
04.06	Understand worker's compensation requirements.
04.07	Compile a complete set of contract documents.
04.08	Understand 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 site.
05.02	Use surveying instruments, such as a transit, site level and/or laser level to determine finish floor elevations, and establish building benchmark(s).
05.03	Evaluate site and existing infrastructure for needs required.
05.04	Read reports from 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 and 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 and 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 and 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 design and 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	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 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 CPR, first aid and AED.
11.02	Instruct new employee on company safety regulations.
11.03	Interpret 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 procedures--The student will be able to:
12.01	Organize work area both in office and field.
12.02	Select and use appropriate forms and computer software.
12.03	Develop and maintain filing system.
12.04	Maintain inventory of physical assets.
12.05	Set up and maintain 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 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 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, workers' 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 appropriate understanding of basic science--The student will be able to:
14.01	Understand the practical application of molecular action as a result of temperature extremes, chemical reaction and moisture content.
14.02	Draw conclusions or make inferences from data.
14.03	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.
14.04	Understand pressure measurement in terms of 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 a job application and submit it.
15.05	Demonstrate competence in job interview techniques.
15.06	Identify or demonstrate appropriate responses to criticism in the workplace.
15.07	Identify acceptable 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 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 "Right-to-Know" 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.

### **Career and Technical Student Organization (CTSO)**

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

### **Accommodations**

Federal and state legislation requires the provision of accommodations for students with disabilities 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

Green Building Construction Technology (0615100104) – 24 Credit Hours

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

Florida Department of Education  
Curriculum Framework

**Program Title:** Drafting and Design Technology  
**Career Cluster:** Architecture and Construction

**AS**

CIP Number	1615130102
Program Type	College Credit
Standard Length	62 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3011 – Architectural and Civil Drafters, 17-3013 – Mechanical Drafters

**Purpose**

The purpose of this program is to prepare students for employment as drafters or chief design drafters for employment and/or career advancement in the design, construction and manufacturing 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, communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, drafting standards, math skills, and drafting office practices to assist mathematical, electrical and electronic, architectural, chemical, civil, or other engineers in the design and drafting of electrical circuits, machines, structures, weldments, or architectural plans. It also includes instruction in the preparation of engineering plans, layouts, and detailed drawings according to conventional projection principles, preparation of charts, graphs or diagrams, and the use of handbook data germane to design and drafting in various fields.

**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 62 credit hours.



## **Standards**

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

- 01.0 Apply basic drafting skills.
- 02.0 Prepare mechanical drawings.
- 03.0 Prepare electrical/electronic drawings.
- 04.0 Prepare civil drafting drawings.
- 05.0 Prepare advanced civil drafting drawings.
- 06.0 Demonstrate understanding of geographic information system (GIS).
- 07.0 Prepare pneumatic/hydraulic drawings (optional).
- 08.0 Apply technical mathematics.
- 09.0 Prepare architectural drawings.
- 10.0 Prepare computer-aided drawings.
- 11.0 Demonstrate appropriate communication skills.
- 12.0 Demonstrate appropriate understanding of basic science.
- 13.0 Demonstrate employability skills.
- 14.0 Demonstrate an understanding of entrepreneurship (optional).
- 15.0 Convert computer aided drafting (CAD) drawings to web format (optional).

Florida Department of Education  
Student Performance Standards

Program Title: Drafting and Design Technology  
 CIP Number: 1615130102  
 Program Length: 62 Credit Hours  
 SOC Code(s): 17-3011

**The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. At the completion of this program, the student will be able to:**

01.0	Apply basic drafting skills—The
01.01	Apply safety practices.
01.02	Operate drafting instruments.
01.03	Perform lettering techniques.
01.04	Prepare multi-view drawings.
01.05	Prepare advanced civil drawings.
01.06	Prepare sectional views.
01.07	Prepare auxiliary views.
01.08	Prepare dimension drawings.
01.09	Prepare pictorial drawings.
01.10	Prepare sketches.
01.11	Prepare title blocks and other formats.
01.12	Compile a portfolio.
01.13	Read and understand fire sprinkler system blueprints (optional).
01.14	Demonstrate an understanding of basic fire sprinkler design (optional).
02.0	Prepare mechanical drawings -- The student should be able to:
02.01	Prepare fastener drawings.

02.02	Prepare cam drawings (optional).
02.03	Prepare gear drawings (optional).
02.04	Prepare assembly drawings.
02.05	Prepare detail drawings.
02.06	Prepare surface developments.
02.07	Prepare technical drawings.
02.08	Prepare welding drawings.
02.09	Prepare bearing drawings (optional).
02.10	Prepare spring drawings.
02.11	Prepare casting drawings.
02.12	Prepare forging drawings (optional).
02.13	Prepare tool drawings (optional).
02.14	Prepare molding diagrams (optional).
02.15	Prepare stamping drawings (optional).
02.16	Prepare numerical-control drawings (optional).
02.17	Prepare computer-aided drawings.
02.18	Modify drawings to include material specifications and parts list.
02.19	Identify geometric tolerances and dimensioning of specific machined surfaces.
03.0	Prepare electrical/electronic drawings -- The student should be able to:
03.01	Prepare schematic drawings.
03.02	Prepare printed circuit board assembly drawing packages.
03.03	Prepare connection drawings.
03.04	Prepare interconnection drawings.

03.05	Prepare wiring drawings.
03.06	Prepare cable drawings and/ or harness drawings.
03.07	Prepare component drawings.
03.08	Prepare logic diagrams.
04.0	Prepare civil drawings -- The student should be able to:
04.01	Demonstrate an understanding of civil drafting.
04.02	Demonstrate knowledge of surveying fundamentals.
04.03	Demonstrate an understanding of mapping scales.
04.04	Demonstrate knowledge of legal descriptions and plot plans.
04.05	Demonstrate an understanding of contour lines.
04.06	Demonstrate knowledge of profiles.
04.07	Demonstrate knowledge of highway layouts.
04.08	Demonstrate an understanding of earth work.
05.0	Prepare advanced civil drafting drawings -- The student should be able to:
05.01	Demonstrate an understanding of curve data.
05.02	Demonstrate an understanding of parcels.
05.03	Demonstrate an understanding of surfaces.
05.04	Demonstrate an understanding of basic structural drawings and detailing conventions.
05.05	Demonstrate an understanding of basic fastening systems used with common materials and manufacturing (metals and wood).
06.0	Demonstrate understanding of geographic information system (GIS) -- The student should be able to:
06.01	Demonstrate a basic knowledge of GIS.
06.02	Demonstrate an understanding of global positioning systems (GPS).
06.03	Demonstrate an understanding of remote sensing.

07.0	Prepare pneumatic/hydraulic drawings (optional) -- The student should be able to:
07.01	Prepare piping drawings.
07.02	Prepare pump and motor drawings.
07.03	Prepare cylinder and piston diagrams.
07.04	Prepare valve drawings.
07.05	Prepare pump section drawings.
07.06	Prepare pulley and chain-drive drawings.
07.07	Understand the requirements of spacing, location and position of sprinkler heads (optional).
07.08	Design a fire sprinkler system in high-rise building (optional).
07.09	Design a fire sprinkler system for water tanks, aircraft hangers and standpipe systems (optional).
07.10	Design a fire sprinkler system for a high-pile storage area and a rack storage area (optional).
07.11	Design a fire sprinkler system for a fire pump and identify its use (optional).
08.0	Apply technical mathematics -- The student should be able to:
08.01	Solve arithmetic problems.
08.02	Solve algebra problems.
08.03	Solve trigonometry problems.
08.04	Solve geometry problems.
08.05	Solve surveying problems.
08.06	Read and understand hydraulic calculations as applied to fire sprinkler systems (optional).
08.07	Learn the basic principles of hydraulics (optional).
08.08	Calculate the required gallons per minute (GPM) required for fire sprinkler systems (optional).
08.09	Incorporate hydraulic calculations into the design of a sprinkler system (optional).
08.10	Understand different pipe size and connection points (optional).

09.0	Prepare architectural drawings -- The student should be able to:
09.01	Prepare floor plan drawings.
09.02	Prepare foundation plan and detail drawings.
09.03	Prepare elevation drawings.
09.04	Prepare landscape layouts (optional).
09.05	Prepare schedules.
09.06	Prepare sections.
09.07	Build architectural models (optional).
09.08	Prepare truss drawings (optional).
09.09	Prepare stairway drawings (optional).
09.10	Prepare fireplace drawings (optional).
09.11	Prepare plot plan drawings.
09.12	Prepare plumbing plan drawings (optional).
09.13	Prepare climate-control drawings (optional).
09.14	Prepare electrical plan drawings (optional).
09.15	Prepare perspective and isometric drawings (optional).
10.0	Prepare computer-aided drawings -- The student should be able to:
10.01	Use system commands.
10.02	Perform drafting procedures.
10.03	Operate peripheral equipment.
10.05	Apply specialized CAD functions.
10.06	Apply computer aided drafting (CAD) drawing standards as established and updated by the industry.
10.07	Construct geometric figures of lines, splines, circles, and arcs.

10.08	Create and edit text using appropriate style and size to annotate drawings.
10.09	Use and control accuracy-enhancement tools for entity-positioning methods, such as snap and XYZ.
10.10	Identify, create, store, and use standard part symbols and libraries.
10.11	Use editing commands.
10.12	Control entity properties by layer, color, and line type.
10.13	Use viewing commands to perform zooming and panning.
10.14	Plot drawings on media using layout and scale.
10.15	Minimize file size.
10.16	Use query commands to interrogate database for entity characteristics, distance, area, and status.
10.17	Apply standard dimensioning rules.
10.18	Export computer aided drafting (CAD) drawings to Web format.
10.19	Demonstrate an understanding of point sources in 3-D.
11.0	Demonstrate appropriate communication skills -- The student should be able to:
11.01	Write logical and understandable statements or phrases to accurately fill out forms/invoices commonly used 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	Demonstrate appropriate telephone/communication skills.
12.0	Demonstrate appropriate understanding of basic science -- The student should be able to:
12.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
12.02	Draw conclusions or make inferences from data.
12.03	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.

12.04	Understand pressure measurement in terms of PSI, inches of mercury, and KPA (optional).
13.0	Demonstrate employability skills -- The student should be able to:
13.01	Conduct a job search.
13.02	Secure information about a job.
13.03	Identify documents that may be required when applying for a job interview.
13.04	Complete a job application form correctly.
13.05	Demonstrate competence in job interview techniques.
13.06	Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other employees.
13.07	Identify acceptable work habits.
13.08	Demonstrate knowledge of how to make job changes appropriately.
13.09	Demonstrate acceptable employee health habits.
13.10	Prepare a work portfolio and resume.
14.0	Demonstrate an understanding of entrepreneurship (optional) -- The student should be able to:
14.01	Define entrepreneurship.
14.02	Describe the importance of entrepreneurship to the American economy.
14.03	List the advantages and disadvantages of business ownership.
14.04	Identify the risks involved in ownership of a business.
14.05	Identify the necessary personal characteristics of a successful entrepreneur.
14.06	Identify the business skills needed to operate a small business.
14.07	Efficiently in a professional manner.
15.0	Convert computer aided drafting (CAD) drawings to web format (optional) -- The student should be able to:
15.01	Export computer aided drafting (CAD) drawings to digital imaging software.
15.02	Demonstrate an understanding of image retouching of portraits by producing digital images to incorporate those features.



15.03 Demonstrate knowledge of photo-masked type by producing digital images to incorporate those features.

15.04 Illustrate web page design procedures.

15.05 Explain web page building procedures.

## **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 intercultural 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:

AutoCAD Foundations (0615130204) – 14 Credit Hours

Drafting Design (0615130101) -- 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 (60)  
**Career Cluster:** Architecture and Construction

**AS**

CIP Number	1646041201
Program Type	College Credit
Standard Length	60 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	11-9021 – Construction Managers 13-1051 – Cost Estimators

**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 Interpret and apply 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 an understanding of entrepreneurship.
- 15.0 Schedule and coordinate work sequence.
- 16.0 Learn to effectively manage a workforce.
- 17.0 Learn to manage subcontract and material supplier contracts.
- 18.0 Learn to effectively “buy out” a project as required.
- 19.0 Demonstrate the ability to use current technology related to the construction process.

Florida Department of Education  
Student Performance Standards

**Program Title:** Construction Management Technology (60)  
**CIP Numbers:** 1646041201  
**Program Length:** 60 Credit Hours  
**SOC Code(s):** 11-9021, 13-1051

**The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. 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	Create written communications appropriate to the construction discipline.
01.02	Identify communication channels in organizations.
01.03	Develop and use effective means of communication.
01.04	Develop an effective working relationship with others.
01.05	Prepare business correspondence, memos and reports.
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 critically by recognizing assumptions and implications and by evaluating ideas.
01.10	Edit effectively all assignments, including informal media (such as email messages).
01.11	Employ 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 and electrical drawings.
02.06	Interpret specifications, relating specifications to the construction drawings.
02.07	Interpret addendums.
02.08	Interpret notice of change and change orders.
02.09	Interpret shop drawings.
02.10	Interpret modular approach to buildings.
02.11	Identify and interpret contracts.
02.12	Identify and interpret liens.
02.13	Interpret deeds.
02.14	Interpret master and development plans and documents.
02.15	Recognize the industry graphic standards as needed by the construction profession such as detailing and note placement.
02.16	Use construction drawings in support of the construction professional's needs, 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	Examine the properties, mechanical tests and quality control tests of common construction materials and their behaviors under different environments, short- or long-term.
03.04	Appraise appropriateness and sustainability of materials for construction projects.
03.05	Appraise appropriateness of construction equipment for hoisting materials, erecting structures and earth moving.
03.06	Understand the basic principles of soil mechanics including soil classification, soil compaction, soil testing and reading soil borehole logs.
03.07	Develop a construction logistics plan (parking and access routes, storage areas, project limit fencing, etc.).
03.08	Relate the sequence of construction activities and importance of safety and constructability issues.

	03.09 Extract and interpret information from building codes and standards.
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	Locate appropriate Code of Federal Regulations (CFR) references for various construction hazards.
04.03	Visually recognize compliance and non-compliance issues and situations.
04.04	Produce summaries that reflect current accident causes and discuss violations, preventive measures and ethical issues.
04.05	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 test.
05.02	Understand ASTM standards for concrete specimen collection and testing and interpret results.
05.03	Interpret soil analysis reports.
05.04	Interpret compaction test reports.
05.05	Determine effect of loads on materials.
05.06	Interpret principles of expansion and contraction and control.
05.07	Interpret and apply fundamentals of site requirements.
05.08	Determine and apply space relationships.
05.09	Demonstrate basic understanding of force systems.
05.10	Demonstrate basic understanding of energy systems.
05.11	Identify basic structural load paths in buildings and other structures to include vertical and lateral load paths.
05.12	Recognize basic structural loads and stresses in existing buildings.
05.13	Describe the basic elements of mechanical, plumbing and heating, ventilation and air conditioning (HVAC) systems.
05.14	Recognize purpose of these basic elements in relation to the system.

05.15	Identify the positioning of such elements relative to each other and to the overall system.
06.0	Interpret and apply codes, regulations and technical literature--The student will be able to:
06.01	Interpret and apply graphic and time saver standards.
06.02	Interpret and apply International Building Code or Florida Building Code.
06.03	Interpret and apply municipal codes and regulations.
06.04	Interpret zoning bylaws and regulations.
06.05	Interpret zoning maps.
06.06	Interpret trade magazines and catalogs.
06.07	Interpret trade manuals.
06.08	Interpret and apply construction association regulations.
07.0	Survey and assess construction sites--The student will be able to:
07.01	Select and apply measuring tapes and chains.
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	Outline basics of site meetings and inspection.
07.08	Apply basic surveying techniques for construction activities.
07.09	Use the transit and level to establish and control horizontal and vertical placement of elements.
07.10	Understand use of modern surveying equipment in 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 of buildings.



08.02	Estimate quantities of excavation and fill.
08.03	Take off quantities of form work.
08.04	Take off quantities of concrete.
08.05	Take off quantities of timber.
08.06	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 considering productivity factors.
08.11	Prepare and use construction cost databases.
08.12	Prepare the scope of subcontractor work, solicit quotations and bids for procurement of products and services, develop the evaluation criteria and select a source.
08.13	Prepare a formal bid package.
08.14	Use the state-of-the-art information technology-to assist in the preparation of the estimate.
09.0	Perform office and administrative procedures -- The student will be able to:
09.01	Maintain record of building costs.
09.02	Develop and maintain technical reference library.
09.03	Identify basic project management systems.
09.04	Understand the project engineer's function on the jobsite with respect to construction documentation and review of submittals and shop drawings.
09.05	Schedule and purchase materials and equipment.
09.06	Maintain RFI and submittal logs.
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.

10.03	Apply ethical principles appropriate to the professional to make informed and principled choices.
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	Measure tolerance (s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
11.03	Demonstrate application of applied mathematics (geometry, basic trigonometry, or statistics) to a variety of applied technical problems.
11.04	Demonstrate application of basic principles of accounting as needed on 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 an understanding of entrepreneurship--The student will be able to:
14.01	Define entrepreneurship.
14.02	List the advantages and disadvantages of business ownership.
14.03	Identify the risks involved in ownership of a business.
14.04	Identify the business skills needed to operate a small business efficiently and effectively.

14.05	Demonstrate application of basic management principles (e.g., principles of management, business management, industrial management, organizational behavior).
14.06	Demonstrate application of economics (macro or micro).
14.07	Demonstrate application of industrial relations (e.g., personnel management, labor relations, supervision and productivity).
14.08	Demonstrate application 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	Identify the critical time required for each activity of work.
15.03	Identify the logical sequence required to perform the work.
15.04	Incorporate estimated activity cost into the proposed 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	Apply state-of-the-art information technology for project planning, design, scheduling, monitoring and controlling.
16.0	Learn to effectively manage a workforce--The student will be able to:
16.01	Interpret construction documents to determine the required staffing to perform the work.
16.02	Identify the equipment required for a specific workforce.
16.03	Understand and guide the workforce in proper and safe methods of construction.
16.04	Effectively track and document time associated with each task so that actual costs can be assigned against budgeted costs to determine profit or loss.
17.0	Learn to manage subcontract and material supplier contracts--The student will be able to:
17.01	Identify the different types of contracts that might be involved on a particular project (AIA General Contract, Subcontracts, Material Purchase Order, Field Purchase Order, etc.)
17.02	Interpret construction documents and identify scope of work within the contract format.
17.03	Interpret construction documents and identify contract cost within the contract format.
17.04	Interpret construction documents and identify contract schedule within contract format.

18.0	Learn to effectively “buy out” a project as required--The student will be able to:
18.01	Interpret drawings and identify the different categories of work specified within the CSI specification format.
18.02	Identify the specific areas of work and contract the scope of work accordingly.
18.03	Effectively package the scope of work within a contract format.
18.04	Identify the cost of each scope of work and compare to budget.
19.0	Demonstrate the ability to use current technology related to the construction process. --The student will be able to:
19.01	Demonstrate a functional (operating) understanding of basic office computer applications.
19.02	Demonstrate a functional (operating) understanding of construction-specific applications of scheduling, estimating and project control typically used in construction industry.
19.03	Demonstrate a basic understanding of Building Information Modeling (BIM) as it pertains 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.

### **Career and Technical Student Organization (CTSO)**

SkillsUSA is the intercultural 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.

### **Program Length**

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The standard length of this program is 60 credit hours according to Rule 6A-14.030, F.A.C.

Florida Department of Education  
Curriculum Framework

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

**AS**

CIP Number	1715020101
Program Type	College Credit
Standard Length	63 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3022 - Civil Engineering Technicians

**Purpose**

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

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Architecture and Construction career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Architecture and Construction career cluster.

The content includes but is not limited to surveying, highway design, soils and foundations, photogrammetry, asphalt design, drainage and geology, concrete design, orientation to utilities, structural design, estimating, drafting, legal and ethical considerations, employability skills, leadership and human relations skills, health and safety, and supportive general education. Computer use is essential. Technical report writing, record keeping and mathematical computations are important aspects of this occupation. **Additional Information** relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

**Program Structure**

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

## **Standards**

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

- 01.0 Solve general, technical and engineering type problems.
- 02.0 Use computer aided drafting (CAD).
- 03.0 Use instruments to construct engineering, mechanical and geometrical type drawings.
- 04.0 Sketch, letter and generate line-work to describe various objects.
- 05.0 Read and produce drawings involving orthographic projection, sections, pictorial and auxiliary views.
- 06.0 Solve typical engineering strength of materials problems using a standard scientific calculator.
- 07.0 Recognize the use of the various materials in the construction industry.
- 08.0 Utilize standard surveying equipment to make measurements and calculations to run a traverse, establish levels, keep notes and produce required drawings.
- 09.0 Recognize the use of the various materials of selected industries.
- 10.0 Produce drawings using computer aided drafting (CAD) software.
- 11.0 Solve engineering graphics problems using standard techniques and reference materials.
- 12.0 Analyze physical and mechanical properties of soil and concrete.
- 13.0 Solve basic hydraulic problems using the theory of incompressible fluids.
- 14.0 Solve problems using theories learned in engineering mechanics.
- 15.0 Establish grades, locate property lines and utilities; and produce plots and calculate cut and fill by average-end-area.
- 16.0 Demonstrate employability skills.

Florida Department of Education  
Student Performance Standards

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

**The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. 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	Given two pieces of data concerning a right triangle, compute the missing sides and/or angles.
01.02	Given necessary data concerning polygons, compute the area.
01.03	Given three pieces of data concerning an oblique triangle, compute the missing sides and angles.
01.04	Given necessary data concerning an oblique triangle, compute the area.
01.05	Given a line graph and one piece of data (ordinate or abscissa), solve for missing ordinate or abscissa data.
01.06	Read and interpret engineering related graphs.
02.0	Use computer aided drafting (CAD)--The student will be able to:
02.01	Use COGO programs to plot surveying/engineering problems.
02.02	Use coordinate data generated from data collectors and computers to plot topographic maps, plats, roadway alignments, parking lots, subdivisions and other appropriate civil engineering projects.
02.03	Using a desktop computer and surveying/engineering software, solve engineering and surveying type problems, such as plats and direction traverses with corrections.
03.0	Use instruments to construct engineering, mechanical and geometrical type drawings--The student will be able to:
03.01	Use curve sets and templates to draw plans and profiles.
03.02	Demonstrate correct use of appropriate drafting instruments in given situations.
04.0	Sketch, letter and generate line-work to describe various objects--The student will be able to:
04.01	Prepare sketches and descriptions of real property.



04.02	Use topographic map symbols including line-work to enhance topographic maps.
04.03	Use proper line symbols and notes from road design standards to prepare plans and profiles.
05.0	Read and produce drawings involving orthographic projection, sections, pictorial and auxiliary views--The student will be able to:
05.01	Produce orthographic projections.
05.02	Produce typical road cross section drawings.
05.03	Produce auxiliary view drawings of utility conflicts.
06.0	Solve typical engineering strength of materials problems using a standard scientific calculator --The student will be able to:
06.01	Calculate forces and stresses in various structural members as determined by the material(s) used.
06.02	Calculate the stresses in bolts and rivets and determine the number needed in different types of connections.
06.03	Determine the centroid location of different cross-sectional shapes.
06.04	Calculate the moment of inertia, radius of gyration and the bending moments of beams.
06.05	Draw a stress-strain diagram.
06.06	Understand the appropriate engineering vocabulary and terminology.
06.07	Have a basic knowledge of the strengths of various engineering materials used in the design of machines and structures.
06.08	Understand the use of the universal testing machine.
07.0	Recognize the use of the various materials in the construction industry--The student will be able to:
07.01	Understand placement and testing of storm sewer drainage pipe and gravity sewer pipe.
07.02	Understand placement and test pressure pipe systems.
07.03	Understand standard ASTM tests and compute results for the following: deformed steel bars, flat stock, standard 505, shear, compressive strength, air entrainment and volume.
07.04	Understand standard Rockwell hardness test.
08.0	Utilize standard surveying equipment to make measurements and calculations to run a traverse, establish levels, keep notes and produce required drawings--The student will be able to:
08.01	Use engineers tape.
08.02	Use plumb bobs.

08.03	Use lock hand level.
08.04	Use total station (engineering data management (EDM) and data collector) equipment.
08.05	Use an automatic level.
08.06	Use field book to keep field notes.
08.07	Use a standard scientific calculator to solve surveying problems.
09.0	Recognize the use of the various materials of selected industries--The student will be able to:
09.01	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.
09.02	Identify reinforcing steel and give use.
09.03	Identify concrete structures.
09.04	Identify asphalt types and uses.
09.05	Identify corrosion preventing coatings.
10.0	Produce drawings using computer aided drafting (CAD) software--The student will be able to:
10.01	Draw large-scale civil drawings.
10.02	Draw details.
11.0	Solve engineering graphics problems using standard techniques and reference materials--The student will be able to:
11.01	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).
11.02	Use typical design standards.
11.03	Use current software for the hydrology of small watersheds.
11.04	Use county soil survey by soil conservation service (USDA assisted by GIS data).
11.05	Prepare a topographic map of a subdivision with standard soil types.
11.06	Using current software and the prepared soils type map, compute peak run off.
12.0	Analyze physical and mechanical properties of soil and concrete--The student will be able to:
12.01	Understand the process and importance of running standard ASTM soil test and compute results for the following:

	a. gradation analysis
	b. Limits – liquid and plastic
	c. modified proctor
	d. moisture content-oven and/or speedy
	e. nuclear density
12.02	Make a trial batch and run a standard ASTM concrete test and compute results for the following:
	a. Slump
	b. air entrainment
	c. compressive strength
13.0	Solve basic hydraulic problems using the theory of incompressible fluids--The student will be able to:
13.01	Compute peak discharge.
13.02	Compute discharge due to developed condition of project.
13.03	Compute quantity of water and wastewater flow and size pressure pipes.
13.04	Size pipes for gravity flow of storm waters.
14.0	Solve problems using theories learned in engineering mechanics--The student will be able to:
14.01	Solve vector addition problems by the component method.
14.02	Given two coordinates, calculate length of line and reference angle.
14.03	Convert from polar to rectangular coordinates and its inverse.
14.04	Compute resultant of concurrent force systems.
14.05	Compute moments about a given point.
14.06	Compute the resultant force from several given couples.
14.07	Compute resultant of plane parallel force systems.
14.08	Compute resultant of nonparallel non-concurrent force systems.

14.09	Replace a force by a force and a couple.
14.10	Construct free body diagrams.
14.11	Solve concurrent coplanar force systems (two equations and two unknowns).
14.12	Solve coplanar nonparallel force systems.
14.13	Analyze frame and truss problems.
15.0	Establish grades, locate property lines and utilities; and produce plots and calculate cut and fill by average-end-area--The student will be able to:
15.01	Calculate horizontal alignment for civil engineering structures.
15.02	Calculate vertical alignment for civil engineering structures.
15.03	Plot and draft maps, plats, plans and profiles, charts and graphs.
15.04	Calculate cuts and fills using average-end-area method.
15.05	Calculate borrow pit quantities.
16.0	Demonstrate employability skills--The student will be able to:
16.01	Conduct a job search.
16.02	Secure information about a job.
16.03	Identify documents that may be required when applying for a job.
16.04	Complete a job application.
16.05	Demonstrate competence in job interview techniques.
16.06	Identify or demonstrate appropriate responses to criticism from employer, supervisor or other persons.
16.07	Identify acceptable work habits.
16.08	Demonstrate knowledge of how to make job changes appropriately.
16.09	Demonstrate acceptable employee health 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 intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

### **Accommodations**

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

Florida Department of Education  
Curriculum Framework

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

**Secondary – Career Preparatory**

Program Number	8101100
CIP Number	0615130111
Grade Level	9-12, 30, 31
Standard Length	6 Credits
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3011 - Architectural and Civil Drafters

**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 consisting of three occupational completion points.

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:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
A	8725010	Drafting 1	BLDG CONSTR @7 7G DRAFTING @7 7G TEC DRAFT 7G TEC CONSTR @7 7G	1 Credit	17-3011	3	PA
B	8725020	Drafting 2		1 Credit	17-3011	3	PA
	8725030	Drafting 3		1 Credit	17-3011	3	PA
	8725040	Drafting 4		1 Credit	17-3011	3	PA
C	8725050	Architectural Drafting 5		1 Credit	17-3011	3	PA
	8725060	Architectural Drafting 6		1 Credit	17-3011	3	PA

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

### Academic Alignment Tables

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth- Space Science	Environmental Science	Genetics	Integrated Science 1	Marine Science 1 Honors	Physical Science	Physics 1
8725010	2/87 2%	4/80 5%	25/83 30%	3/69 4%	26/67 39%	1/70 1%	4/69 6%	26/82 32%	4/66 6%	26/74 35%	4/72 6%
8725020	2/87 2%	3/80 4%	26/83 31%	3/69 4%	28/67 42%	2/70 3%	3/69 4%	27/82 33%	4/66 6%	27/74 36%	3/72 4%
8725030	22/87 25%	24/80 30%	2/83 2%	23/69 33%	4/67 6%	22/70 31%	22/69 32%	3/82 4%	25/66 38%	4/74 5%	23/72 32%
8725040	24/87 28%	24/80 30%	2/83 2%	24/69 35%	2/67 3%	22/70 31%	24/69 35%	2/82 2%	2/66 3%	2/74 3%	24/72 33%
8725450	**	**	**	**	**	**	**	**	**	**	**
8725460	**	**	**	**	**	**	**	**	**	**	**

\*\* Alignment pending review

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8725010	21/67 31%	9/75 12%	40/54 74%	14/46 30%	14/45 31%	#	#

8725020	19/67 28%	9/75 12%	37/54 69%	17/46 37%	17/45 38%	#	#
8725030	11/67 16%	18/75 24%	24/54 44%	#	#	9/45 20%	9/45 20%
8725040	11/67 16%	16/75 21%	21/54 39%	#	#	8/45 18%	8/45 18%
8725450	3/67 4%	1/75 1%	18/54 33%	#	#	17/45 38%	17/45 38%
8725460	7/67 10%	2/75 3%	20/54 37%	#	#	19/45 42%	19/45 42%

# Alignment attempted, but no correlation to academic course

### **Florida Standards for Technical Subjects**

*Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education.*

**Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.**

### **Florida Standards for English Language Development (ELD)**

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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.



## **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 Design and prepare multi-view drawings.
- 03.0 Prepare sectional views.
- 04.0 Prepare auxiliary drawings.
- 05.0 Apply basic dimensioning.
- 06.0 Prepare pictorial drawings.
- 07.0 Prepare surface developments.
- 08.0 Design and prepare basic architectural drawings.
- 09.0 Perform basic computer aided drafting functions.
- 10.0 Demonstrate understanding of basic civil drawings.
- 11.0 Prepare computer aided drawings (CAD).
- 12.0 Research the history of the built environment.
- 13.0 Perform computer aided drafting functions.
- 14.0 Describe the importance of professional ethics and legal responsibilities in the design and construction industry.
- 15.0 Examine career opportunities in drafting and related fields to determine requisite skills, qualifications, supply and demand, market location and potential earnings.
- 16.0 Apply three-dimensional modeling concepts.
- 17.0 Explain three-dimensional modeling.
- 18.0 Investigate sustainability issues related to the design, construction and maintenance of the built environment.
- 19.0 Prepare computer aided three-dimensional architectural drawings.
- 20.0 Design and draft architectural multi-level residential drawings.
- 21.0 Prepare a basic plot plan drawing.
- 22.0 Design and draft a basic landscape plan drawing.
- 23.0 Prepare typical wall section.
- 24.0 Prepare a basic foundation plan drawing.
- 25.0 Prepare a basic electrical plan drawing.
- 26.0 Prepare a basic heating, ventilation and air-conditioning (HVAC) plan drawing.
- 27.0 Prepare a basic plumbing plan drawing.
- 28.0 Design and draft architectural drawings for a commercial building.
- 29.0 Draft basic 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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
01.0 Apply basic drafting skills--The student will be able to:		
01.01 Use and maintain drafting equipment, measuring scales, drafting instruments and reproduction equipment.	LAFS.910.L.3.6 LAFS.910.SL.2.5,6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,3	
01.02 Identify and use the various drafting media and techniques.	LAFS.910.L.3.6 LAFS.910.SL.2.5,6 LAFS.910.W.4.10	
01.03 Demonstrate the use of the alphabet of lines.	LAFS.910.L.3.6 LAFS.910.SL.2.5,6 LAFS.910.W.4.10	
01.04 Prepare title blocks and other drafting formats.	LAFS.910.SL.1.2 LAFS.910.SL.2.4,5 LAFS.910.W.4.10	
01.05 Use various freehand and other lettering techniques.	LAFS.910.L.3.6 LAFS.910.SL.2.4,5,6 LAFS.910.W.4.10	
01.06 Develop skill in sketching and mark making to plan, execute and construct two-dimensional images or three-dimensional models.	LAFS.910.SL.1.1 LAFS.910.W.4.10 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7,8 MAFS.912.G-GMD.2.4	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	MAFS.912.G-MG.1.1 MAFS.912.SRT.1.1	
01.07 Prepare presentation graphics.	LAFS.910.SL.2.4,5,6	
01.08 Apply geometric construction techniques.	LAFS.910.RI.1.1 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7,8 MAFS.912.G-GMD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.3.6 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.SRT.1.1	
01.09 Solve geometric, algebraic and trigonometric problems related to drafting.	LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.A-REI.1.1 MAFS.912.F-TF.1.3 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7,8 MAGS.912.G-SRT.2.5 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.3	
01.10 Demonstrate care of equipment.		
01.11 Apply use of effective and accurate architectural and/or engineering vocabulary throughout design and drafting process.	LAFS.910.L.3.6 LAFS.910.W.4.10	
02.0 Design and prepare multi-view drawings--The student will be able to:		
02.01 Analyze challenges and identify solutions for design problems.	LAFS.910.RI.1.1,3 LAFS.910.W.2.6 LAFS.910.W.3.7,8,9	
02.02 Investigate the use of space, scale and environmental features to create three-dimensional form, or the illusion of depth and form.	LAFS.910.W.2.6 LAFS.910.W.3.7,8,9 MAFS.912.G-SRT.1.1 MAFS.912.N-Q.1.2	
02.03 Prepare multi-view scaled drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
02.04 Select proper drawing scale, views and layout.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-SRT.1.1 MAFS.912.N-Q.1.1,2,3	
02.05 Prepare drawings containing horizontal and vertical surfaces.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
02.06 Prepare drawings containing circles and/or arcs.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-SRT.1.1,2	
02.07 Prepare removed details and conventional breaks.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
02.08 Prepare assembly drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
02.09 Prepare detail drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
02.10 Prepare technical drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
02.11 Modify drawings to include material specifications and parts list.	LAFS.910.L.3.6 LAFS.910.W.2.5,6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3	
03.0 Prepare sectional views--The student will be able to:	LAFS.910.W.2.6	
03.01 Prepare drawings containing full sections and half sections.	LAFS.910.L.3.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GMD.2.4 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
03.02 Prepare drawings containing offset sections.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GMD.2.4 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
03.03 Prepare drawings containing revolved sections.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G-CO.4.12,13 MAFS.912.G-GMD.2.4 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
03.04 Prepare drawings containing removed sections and broken-out sections.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.N-Q.1.1,2,3	
03.05 Prepare a sectional assembly drawing applying material symbols.	LAFS.910.L.3.6 LAFS.910.W.2.5,6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2 MAFS.912.G-GPE.2.6,7 MAFS.912.G-GMD.2.4 MAFS.912.G-MG.1.1 MAFS.912.N-Q.1.1,2,3	
04.0 Prepare auxiliary drawings--The student will be able to:		SC.912.N.3.5
04.01 Prepare drawings containing primary auxiliary views.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-	



CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.G-MG.1.1 MAFS.912.G-GMD.2.4 MAFS.912.N-Q.1.1,2,3	
04.02 Prepare drawings containing auxiliary views that include curved lines.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
05.0 Apply basic dimensioning--The student will be able to:		SC.912.N.3.5
05.01 Prepare drawings containing linear, angular and circular standard dimensions.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2	
05.02 Prepare drawings using general and local notes.	LAFS.910.L.3.6 LAFS.910.RI.1.1 LAFS.910.W.2.6 LAFS.910.W.4.10	
05.03 Apply basic tolerance techniques and nominal and actual dimensions.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
05.04 Analyze and apply data and measurements to solve problems and interpret drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-MG.1.1,2,3	
06.0 Prepare pictorial drawings--The student will be able to:		SC.912.N.3.5
06.01 Prepare isometric, oblique and other pictorial drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1	
06.02 Prepare one- and two-point perspectives.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
07.0 Prepare surface developments--The student will be able to:		SC.912.N.3.5
07.01 Prepare developments of prisms, cylinders, cones and pyramids.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-CO.4.12,13 MAFS.912.G-GMD.1.1 MAFS.912.G-MG.1.1	
07.02 Prepare developments of a transition piece.	LAFS.910.L.3.6 LAFS.910.W.2.6	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	LAFS.910.W.4.10 MAFS.912.G- CO.4.12,13 MAFS.912.G-GMD.1.1 MAFS.912.G-MG.1.1	
07.03 Prepare drawings involving intersecting pieces.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G- CO.4.12,13 MAFS.912.G-GMD.1.1 MAFS.912.G-MG.1.1	

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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
08.0 Design and prepare basic architectural drawings--The student will be able to:		SC.912.E.7.4,8; SC.912.L.17.16; SC.912.N.3.5; SC.912.P.10.4; SC.912.P.12.3
08.01 Solve design problems, through convergent and divergent thinking, to gain new perspectives.	LAFS.910.RI.1.1,3 LAFS.910.SL1.1,2,3 LAFS.910.W.3.7,8,9	
08.02 Apply critical thinking and problem solving skills to develop creative solutions for design problems.	LAFS.910.RI.1.1,3 LAFS.910.SL1.1,2,3 LAFS.910.W.3.7,8,9	
08.03 Draw site plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G-SRT.1.1,2	
08.04 Draw floor plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
08.05 Draw interior and exterior elevations.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
08.06 Draw roof plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
08.07 Prepare door/ window schedules.	MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
08.08 Draw wall sections.	LAFS.910.L.3.6 LAFS.910.SL.1.2 LAFS.910.SL.2.4,5,6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
08.09 Draw plot plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
08.10 Draw electrical plan.	LAFS.910.L.3.6 LAFS.910.SL.1.2 LAFS.910.SL.2.4,5,6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
08.11 Review and revise plans throughout the design process to refine and achieve design objective.	LAFS.910.W.3.7,8,9	
08.12 Demonstrate flexibility and adaptability throughout the design process.	LAFS.910.W.2.5,6,7,8,9	
08.13 Define a basic project materials list.		
08.14 Calculate a basic project quantity take-off.		
09.0 Perform basic computer aided drafting functions--The student will be able to:		
09.01 Demonstrate organizational skills to influence the sequential process when creating drawings.	LAFS.910.RI.1.1	
09.02 Construct geometric figures of lines, splines, circles and arcs.	LAFS.910.L.3.6 LAFS.910.W.2.5,6 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2	
09.03 Create and edit text using appropriate style and size to annotate drawings.	LAFS.910.L.3.6 LAFS.910.W.2.5,6	
09.04 Use control accuracy enhancement tools for entity positioning methods such as snap and XYZ.	LAFS.910.L.3.6 LAFS.910.W.2.6	
09.05 Use editing commands.	LAFS.910.L.3.6 LAFS.910.W.2.5,6	
09.06 Use viewing commands to perform zooming and panning.	LAFS.910.L.3.6 LAFS.910.W.2.6	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
09.07 Plot drawings on media using layout and scale.	LAFS.910.L.3.6 LAFS.910.W.2.6 MAFS.912.G-MG.1.3 MAFS.912.G-SRT.1.1	
09.08 Use query commands to interrogate database for entity characteristics, distance, area and status.	LAFS.910.L.3.6 LAFS.910.W.2.6	
09.09 Apply standard dimensioning rules.	LAFS.910.L.3.6 LAFS.910.W.2.6 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,3	
09.10 Move, stretch and offset objects.	LAFS.910.L.3.6 LAFS.910.W.2.6	
09.11 Create a radius between objects.	LAFS.910.L.3.6 LAFS.910.W.2.6 MAFS.912.G-C.1.2	
09.12 Trim and extend objects.	LAFS.910.L.3.6 LAFS.910.W.2.6	
09.13 Break and join objects.	LAFS.910.L.3.6 LAFS.910.W.2.6	
09.14 Create and edit dimensions.	LAFS.910.L.3.6 LAFS.910.W.2.5,6 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,3	
09.15 Change object properties.	LAFS.910.L.3.6 LAFS.910.W.2.5,6	
10.0 Demonstrate understanding of basic civil drawings--The student will be able to:		SC.912.E.6.4; SC.912.L.17.16; SC.912.N.3.5
10.01 Apply use of effective and accurate civil terminology throughout the design process.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10	
10.02 Read and interpret civil drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10	
10.03 Draw plan and profile drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2	



CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.GMD.2.4 MAFS.912.G-MG.1.1	
10.04 Develop topographic drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.0 Prepare computer aided drawings (CAD)--The student will be able to:		
11.01 Draw a floor plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.02 Draw a site plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.03 Draw exterior and interior elevations.	LAFS.910.L.3.6 LAFS.910.SL.1.2 LAFS.910.SL.2.4,5,6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G- CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G- CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.04 Draw a roof plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G- CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G- CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.05 Prepare door and window schedules.	LAFS.910.L.3.6 LAFS.910.SL.1.2 LAFS.910.SL.2.4,5,6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G- CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.06 Draw a wall section.	LAFS.910.L.3.6 LAFS.910.SL.1.2 LAFS.910.SL.2.4,5 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G- CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G- CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.07 Draw an overall site plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G- CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G- CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.08 Draw a building plot plan.		
11.09 Draw an electrical plan.	LAFS.910.L.3.6 LAFS.910.SL.1.2 LAFS.10.SL.2.4,5,6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
		MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
12.0	Research the history of the built environment.		
12.01	Describe the significance of major architects, engineers or inventors to understand their historical influences.	LAFS.910.RI.1.1,2,3 LAFS.910.RI.3.7 LAFS.910.SL.1.1,2,3	
12.02	Research innovative historical architectural and/or engineering works and examine the significance of their legacy for the future.	LAFS.910.RI.1.1,2,3 LAFS.910.RI.3.7 LAFS.910.SL.1.1,2,3	
12.03	Identify transitions in design media, technique and focus to explain how technology has changed design throughout history.	LAFS.910.RI.1.1,2,3 LAFS.910.RI.3.7 LAFS.910.SL.1.1,2,3	

**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
13.0 Perform computer aided drafting functions--The student will be able to:		
13.01 Draw lines, arcs, circles, etc. to represent plans and/or mechanical assemblies.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
13.02 Create text styles, text justification and multi-line text.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.03 Create and use multi-leaders.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.04 Edit dimensions.	LAFS.1112.L.3.6 LAFS.1112.W.2.5,6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
13.05 Work with dimension styles.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.06 Crosshatch objects.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.07 Apply external references.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.08 Isolate and hide objects.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.09 Use selection set methods.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.10 Use rectangular and polar arrays.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.11 Use rotation reference angles.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-CO.1.5 MAFS.912.F-TF.1.1	
13.12 Use elements of creativity and organizational principles to create visually coherent viewports and layouts.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 MAFS.912.G-CO.4.12 MAFS.912.G-SRT.1.1	
13.13 Create and manage layers.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
13.14 Use page setup for plotting.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-SRT.1.1	
13.15 Create, insert and edit reusable content such as symbols and blocks.	LAFS.1112.L.3.6 LAFS.1112.W.2.5,6 LAFS.1112.W.4.10	
13.16 Use specific line types.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.17 Create fills and gradients.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.18 Edit hatch patterns and fills.	LAFS.1112.L.3.6 LAFS.1112.W.2.5,6 LAFS.1112.W.4.10	
14.0 Describe the importance of professional ethics and legal responsibilities in the design and construction industry--The student will be able to:		SC.912.E.7.8; SC.912.L.17.13; SC.912.N.4.1, 2
14.01 Evaluate and justify decisions based on ethical reasoning.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.8	
14.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities and employer policies.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.8	
14.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.8	
14.04 Interpret and explain written organizational policies and procedures.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.8	
14.05 Demonstrate personal responsibility, ethics and integrity, including respect for intellectual property, when accessing information and creating design projects.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.8	
15.0 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:		
15.01 Identify and demonstrate positive work behaviors needed to be employable.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.7,8	
15.02 Develop and use criteria to select works for a digital career portfolio.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.7,8	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
15.03 Evaluate and compare employment opportunities that match career goals.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.7,8	
15.04 Examine licensing, certification, education and industry credentialing requirements for careers in design and construction industry.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.7,8	
15.05 Identify opportunities and research requirements for career advancement.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.7,8	



**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
16.0 Apply three-dimensional modeling concepts--The student will be able to:		
16.01 Use coordinate systems to locate objects in three dimensional space.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.N-VM.1.1 MAFS.912.N-VM.2.4,5	
16.02 Use basic geometric shapes available in two-dimensional and three-dimensional modeling software.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2	
16.03 Define the parameters used for determining size, placement and orientation of a modeling object.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2	
16.04 Describe the Boolean modeling operations of union, subtraction and intersection.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-GMD.1.1	

CTE Standards and Benchmarks		FS-M/LA	NGSS-Sci
		MAFS.912.N-Q.1.1,2,3	
16.05	Demonstrate extrusion or sweeping techniques that transform two-dimensional objects into three-dimensional objects.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.06	Describe the 'revolve' or 'lathe' techniques for animating a two-dimensional object and give examples of their application.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.07	Use scale, rotate and move actions that comprise the transformation technique for animating a three-dimensional object.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.08	Use basic viewing navigation tools such as zoom, rotate and panning.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.09	Work with materials, techniques and processes through practice and perseverance to create desired result in two-dimensional and three-dimensional models.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.10	Analyze challenges and identify solutions for three-dimensional design problems.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.11	Investigate the use of space, scale and environmental features within a model to create three-dimensional form or the illusion of depth and form.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.12	Apply materials, ideas, images and/or equipment from other content areas to generate ideas and processes for the development of three-dimensional models.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.13	Investigate the use of various technology, software and media design to reflect creative trends in visual culture.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
17.0	Explain three-dimensional modeling--The students will be able to:		
17.01	Define three-dimensional modeling.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8 MAFS.912.CO.1.1,2,3,4,5 MAFS.912.CO.2.6,7,8	
17.02	Describe the polygonal, non-uniform rational b-spline (NURBS), splines and patches and primitives of three-dimensional modeling.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8 MAFS.912.CO.1.1,2,3,4,5	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.CO.2.6,7,8	
17.03 Describe the constructive solid geometry method of three-dimensional modeling.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8 MAFS.912.CO.1.1,2,3,4,5 MAFS.912.CO.2.6,7,8	
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.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	
18.02 Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	
18.03 Research and recommend sustainable design solutions.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	
18.04 Identify specific design practices that can lessen adverse impacts on the environment.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	
18.05 Explain the environmentally sustainable features of a building.	LAFS.1112.RI.3.8 LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	

**Florida Department of Education  
Student Performance Standards**

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

**Course Description:**

This course focuses on three-dimensional architectural drawings and residential architectural drafting and design.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: NGSSS-Sci.*

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
19.0 Prepare computer aided three-dimensional architectural drawings--The student will be able to:		
19.01 Use technology to facilitate creative process and techniques.	LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	
19.02 Investigate the use of various technologies and resources to inspire creative design.	LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	
19.03 Compare and analyze traditional and digital media to learn how technology has altered opportunities for innovative responses and results.	LAFS.1112.RI.3.8 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	
19.04 Draw plans and elevations.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
19.05 Draw isometric exterior views.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
19.06 Draw perspective exterior views.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
20.0 Design and draft architectural multi-level residential drawings--The student will be able to:		
20.01 Compare architectural designs to understand how technical and utilitarian components impact aesthetic qualities.	LAFS.1112.RI.3.8	
20.02 Apply rules of convention to create purposeful residential design.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
20.03 Analyze the capacity of the visual arts to fulfill aesthetic needs through architectural and utilitarian objects.	LAFS.1112.RI.3.8	
20.04 Design and draft first floor plan.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
20.05 Design and draft second floor plan.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
20.06 Design and draft basic roof framing layout drawing.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
20.07 Design and draft two-story elevation drawing.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
20.08 Prepare second floor framing plan.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
21.0 Prepare a basic plot plan drawing--The student will be able to:		
21.01 Layout a residential plot.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
21.02 Indicate plot size and limits.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-SRT.1.1	
21.03 Indicate plot orientation.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
21.04 Layout a public street and sidewalk.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-CO.1.1	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	MAFS.912.N-Q.1.1,2,3	
21.05 Layout public utility lines.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-CO.1.1 MAFS.912.N-Q.1.1,2,3	
21.06 Write a plot legal description.	LAFS.1112.L.3.6 LAFS.1112.W.1.2:A,B,C, D,E LAFS.1112.W.2.4,5,6 LAFS.1112.W.4.10	
21.07 Dimension building location.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-SRT.1.1	
21.08 Layout and label specialty features (patio/ pool/ gazebo).	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
21.09 Locate easements and setbacks.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-CO.1.1	
<b>22.0 Design and draft a basic landscape plan drawing--The student will be able to:</b>		
22.01 Research and specify water-efficient landscaping.	LAFS.1112.W.2.6 LAFS.1112.W.3.7,8,9 LAFS.1112.RI.1.1,2,3	
22.02 Layout landscape features.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.N-Q.1.1,2,3	
22.03 Develop a schedule of plants/shrubs.	LAFS.1112.L.3.6 LAFS.1112.SL.2.4,5,6 LAFS.1112.SL.1.2 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
22.04 Develop a list of landscape symbols.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	



Florida Department of Education  
Student Performance Standards

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

**Course Description:**

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

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: NGSSS-Sci.*

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
23.0 Prepare typical wall section--The student will be able to:		
23.01 Prepare a two-story residential wall section.	LAFS.1112.L.3.6 LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-MG.2.4 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
23.02 Apply notes and dimensions to residential wall section.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
24.0 Prepare a basic foundation plan drawing--The student will be able to:		
24.01 Prepare a foundation plan drawing for a residence.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
24.02 Prepare foundation detail drawings.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
25.0 Prepare a basic electrical plan drawing--The student will be able to:		
25.01 Lay out an electrical plan for a residence.	LAFS.1112.L.3.6 LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 LAFS.1112.RI.1.2 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
25.02 Apply electrical symbols legend to electrical plan.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
26.0 Prepare a basic heating, ventilation and air-conditioning (HVAC) plan drawing--The student will be able to:		
26.01 Lay out an HVAC plan for a residence.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
26.02 Prepare HVAC symbols legend for HVAC plan.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
27.0 Prepare a basic plumbing plan drawing--The student will be able to:		
27.01 Lay out a plumbing plan for a residence.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
27.02 Draw a plumbing riser diagram for a residence.		
27.03 Prepare plumbing symbols legend for plumbing plan.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
28.0 Design and draft architectural drawings for a commercial building--The student will be able to:		
28.01 Apply rules of convention to create purposeful commercial design.	LAFS.1112.RI.3.8,9	
28.02 Interpret catalogs, specifications, technical tables, codes and ordinances for commercial buildings.	LAFS.1112.RI.3.8,9 LAFS.1112.RI.1.1,2,3	
28.03 Prepare a commercial site plan.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G- C.1.1,2,3,4 MAFS.912.G- CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G- CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
28.04 Design and draft floor plan, with dimensions for a commercial building.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G- C.1.1,2,3,4 MAFS.912.G- CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G- CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
28.05 Prepare foundation plan with dimensions and footing schedule.	MAFS.912.N-Q.1.1,2,3  LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
28.06 Prepare roof plan.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
28.07 Design and draft elevation drawings.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
28.08 Prepare building section.	LAFS.1112.L.3.6 LAFS.1112.SL.1.2 LAFS.912.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
28.09 Prepare door and window schedules.	LAFS.1112.L.3.6 LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
29.0 Draft basic mechanical, electrical and plumbing (MEP) drawings--The student will be able to:		
29.01 Lay out an electrical plan for a commercial building.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
29.02 Lay out heating, ventilation and air-conditioning (HVAC) plan for a commercial building.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
29.03 Lay out a plumbing plan for a commercial building.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
<b>30.0 Prepare presentation drawings--The student will be able to:</b>		
30.01 Create a body of collaborative work to show artistic cohesiveness, team building, respectful compromise and time-management skills.	LAFS.1112.SL.1.1,2,3 LAFS.1112.SL.2.4,5,6	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	MAFS.912.A-SSE.2.4	
30.02 Concentrate on a particular style, theme or concept to compile content for a portfolio, display or exhibition.	LAFS.1112.SL.1.1,2,3 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.3.7,8,9	
30.03 Process and apply constructive criticism as formative assessment for continued creative growth.	LAFS.1112.SL.1.1,2,3	
30.04 Produce color pictorial drawings for a commercial building.	LAFS.1112.SL.2.4,5,6 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2	
30.05 Prepare a dynamic presentation zoom views or walk-thru.	LAFS.1112.SL.2.4,5,6	
30.06 Develop a presentation of digital portfolio to interview and/ or apply for a drafting-related position or educational program.	LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6	



## **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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

SkillsUSA is the intercurricular 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.

### **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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified

for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education  
Curriculum Framework

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

**Secondary – Career Preparatory**

Program Number	8101200
CIP Number	0615130112
Grade Level	9-12, 30, 31
Standard Length	6 Credits
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3011 - Architectural and Civil Drafters 17-3019 - Drafters, All Other

**Purpose**

The purpose of this program is to prepare students for employment or advanced training in the structural 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. **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.

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:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
A	8725010	Drafting 1	BLDG CONSTR @7 7G DRAFTING @7 7G TEC DRAFT 7G TEC CONSTR @7 7G	1 Credit	17-3011	3	PA
B	8725020	Drafting 2		1 Credit	17-3011	3	PA
	8725030	Drafting 3		1 Credit	17-3011	3	PA
	8725040	Drafting 4		1 Credit	17-3011	3	PA
C	8725550	Structural Drafting 5		1 Credit	17-3019	3	PA
	8725560	Structural Drafting 6		1 Credit	17-3019	3	PA

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

### Academic Alignment Tables

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science 1	Marine Science 1 Honors	Physical Science	Physics 1
8725010	2/87 2%	4/80 5%	25/83 30%	3/69 4%	26/67 39%	1/70 1%	4/69 6%	26/82 32%	4/66 6%	26/74 35%	4/72 6%
8725020	2/87 2%	3/80 4%	26/83 31%	3/69 4%	28/67 42%	2/70 3%	3/69 4%	27/82 33%	4/66 6%	27/74 36%	3/72 4%
8725030	22/87 25%	24/80 30%	2/83 2%	23/69 33%	4/67 6%	22/70 31%	22/69 32%	3/82 4%	25/66 38%	4/74 5%	23/72 32%
8725040	24/87 28%	24/80 30%	2/83 2%	24/69 35%	2/67 3%	22/70 31%	24/69 35%	2/82 2%	2/66 3%	2/74 3%	24/72 33%
8725550	**	**	**	**	**	**	**	**	**	**	**
8725560	**	**	**	**	**	**	**	**	**	**	**

\*\* Alignment pending review

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8725010	21/67 31%	9/75 12%	40/54 74%	14/46 30%	14/45 31%	#	#
8725020	19/67 28%	9/75 12%	37/54 69%	17/46 37%	17/45 38%	#	#

8725030	11/67 16%	18/75 24%	24/54 44%	#	#	9/45 20%	9/45 20%
8725040	11/67 16%	16/75 21%	21/54 39%	#	#	8/45 18%	8/45 18%
8725550	4/67 6%	2/75 3%	19/54 35%	#	#	12/45 27%	12/45 27%
8725560	3/67 4%	6/75 8%	19/54 35%	#	#	14/45 31%	14/31 31%

# Alignment attempted, but no correlation to academic course

### **Florida Standards for Technical Subjects**

*Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education.*

**Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.**

### **Florida Standards for English Language Development (ELD)**

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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.

## **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 Design and prepare multi-view drawings.
- 03.0 Prepare sectional views.
- 04.0 Prepare auxiliary drawings.
- 05.0 Apply basic dimensioning.
- 06.0 Prepare pictorial drawings.
- 07.0 Prepare surface developments.
- 08.0 Design and prepare basic architectural drawings.
- 09.0 Perform basic computer aided drafting functions.
- 10.0 Prepare basic civil drawings.
- 11.0 Prepare computer aided drawings (CAD).
- 12.0 Research the history of the built environment.
- 13.0 Perform computer aided drafting functions.
- 14.0 Describe the importance of professional ethics and legal responsibilities in the design and construction industry.
- 15.0 Examine career opportunities in drafting and related fields to determine requisite skills, qualifications, supply and demand, market location and potential earnings
- 16.0 Apply three-dimensional modeling concepts.
- 17.0 Explain three-dimensional modeling.
- 18.0 Investigate sustainability issues related to the design, construction and maintenance of the built environment.
- 19.0 Investigate the surveying and mapping profession.
- 20.0 Conduct survey measurements.
- 21.0 Design and draft map drawings.
- 22.0 Design and draft computer aided map details.
- 23.0 Prepare surveying and mapping drawings.
- 24.0 Investigate the use of aerial photography in surveying and mapping.
- 25.0 Conduct surveying and mapping procedures.
- 26.0 Design and draft basic civil drawings.
- 27.0 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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
01.0 Apply basic drafting skills--The student will be able to:		
01.01 Use and maintain drafting equipment, measuring scales, drafting instruments and reproduction equipment.	LAFS.910.L.3.6 LAFS.910.SL.2.5,6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,3	
01.02 Identify and use the various drafting media and techniques.	LAFS.910.L.3.6 LAFS.910.SL.2.5,6 LAFS.910.W.4.10	
01.03 Demonstrate the use of the alphabet of lines.	LAFS.910.L.3.6 LAFS.910.SL.2.5,6 LAFS.910.W.4.10	
01.04 Prepare title blocks and other drafting formats.	LAFS.910.SL.1.2 LAFS.910.SL.2.4,5 LAFS.910.W.4.10	
01.05 Use various freehand and other lettering techniques.	LAFS.910.L.3.6 LAFS.910.SL.2.4,5,6 LAFS.910.W.4.10	
01.06 Develop skill in sketching and mark making to plan, execute and construct two-dimensional images or three-dimensional models.	LAFS.910.SL.1.1 LAFS.910.W.4.10 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7,8 MAFS.912.G-GMD.2.4 MAFS.912.G-MG.1.1	



CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	MAFS.912.SRT.1.1	
01.07 Prepare presentation graphics.	LAFS.910.SL.2.4,5,6	
01.08 Apply geometric construction techniques.	LAFS.910.RI.1.1 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7,8 MAFS.912.G-GMD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.3.6 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.SRT.1.1	
01.09 Solve geometric, algebraic and trigonometric problems related to drafting.	LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.A-REI.1.1 MAFS.912.F-TF.1.3 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7,8 MAFS.912.G-CO.2.7,8 MAGS.912.G-SRT.2.5 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.3	
01.10 Demonstrate care of equipment.		
01.11 Apply use of effective and accurate architectural and/or engineering vocabulary throughout design and drafting process.	LAFS.910.L.3.6 LAFS.910.W.4.10	
02.0 Design and prepare multi-view drawings--The student will be able to:		
02.01 Analyze challenges and identify solutions for design problems.	LAFS.910.RI.1.1,3 LAFS.910.W.2.6 LAFS.910.W.3.7,8,9	
02.02 Investigate the use of space, scale and environmental features to create three-dimensional form, or the illusion of depth and form.	LAFS.910.W.2.6 LAFS.910.W.3.7,8,9 MAFS.912.G-SRT.1.1 MAFS.912.N-Q.1.2	
02.03 Prepare multi-view scaled drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
02.04 Select proper drawing scale, views and layout.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-SRT.1.1 MAFS.912.N-Q.1.1,2,3	
02.05 Prepare drawings containing horizontal and vertical surfaces.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
02.06 Prepare drawings containing circles and/or arcs.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-SRT.1.1,2	
02.07 Prepare removed details and conventional breaks.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
02.08 Prepare assembly drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
02.09 Prepare detail drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
02.10 Prepare technical drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
02.11 Modify drawings to include material specifications and parts list.	LAFS.910.L.3.6 LAFS.910.W.2.5,6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3	
03.0 Prepare sectional views--The student will be able to:	LAFS.910.W.2.6	
03.01 Prepare drawings containing full sections and half sections.	LAFS.910.L.3.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GMD.2.4 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
03.02 Prepare drawings containing offset sections.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GMD.2.4 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
03.03 Prepare drawings containing revolved sections.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GMD.2.4 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
03.04 Prepare drawings containing removed sections and broken-out sections.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.N-Q.1.1,2,3	
03.05 Prepare a sectional assembly drawing applying material symbols.	LAFS.910.L.3.6 LAFS.910.W.2.5,6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2 MAFS.912.G-GPE.2.6,7 MAFS.912.G-GMD.2.4 MAFS.912.G-MG.1.1 MAFS.912.N-Q.1.1,2,3	
04.0 Prepare auxiliary drawings--The student will be able to:		SC.912.N.3.5
04.01 Prepare drawings containing primary auxiliary views.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.G-MG.1.1 MAFS.912.G-GMD.2.4 MAFS.912.N-Q.1.1,2,3	
04.02 Prepare drawings containing auxiliary views that include curved lines.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
05.0 Apply basic dimensioning--The student will be able to:		SC.912.N.3.5
05.01 Prepare drawings containing linear, angular and circular standard dimensions.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2	
05.02 Prepare drawings using general and local notes.	LAFS.910.L.3.6 LAFS.910.RI.1.1 LAFS.910.W.2.6 LAFS.910.W.4.10	
05.03 Apply basic tolerance techniques and nominal and actual dimensions.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	MAFS.912.N-Q.1.1,2,3	
05.04 Analyze and apply data and measurements to solve problems and interpret drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-MG.1.1,2,3	
06.0 Prepare pictorial drawings--The student will be able to:		SC.912.N.3.5
06.01 Prepare isometric, oblique and other pictorial drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1	
06.02 Prepare one- and two-point perspectives.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
07.0 Prepare surface developments--The student will be able to:		SC.912.N.3.5
07.01 Prepare developments of prisms, cylinders, cones and pyramids.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-CO.4.12,13 MAFS.912.G-GMD.1.1 MAFS.912.G-MG.1.1	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
07.02 Prepare developments of a transition piece.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-CO.4.12,13 MAFS.912.G-GMD.1.1 MAFS.912.G-MG.1.1	
07.03 Prepare drawings involving intersecting pieces.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-CO.4.12,13 MAFS.912.G-GMD.1.1 MAFS.912.G-MG.1.1	



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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
08.0 Design and prepare basic architectural drawings--The student will be able to:		SC.912.E.7.4,8; SC.912.L.17.16; SC.912.N.3.5; SC.912.P.10.4; SC.912.P.12.3
08.01 Solve design problems, through convergent and divergent thinking, to gain new perspectives.	LAFS.910.RI.1.1,3 LAFS.910.SL1.1,2,3 LAFS.910.W.3.7,8,9	
08.02 Apply critical thinking and problem solving skills to develop creative solutions for design problems.	LAFS.910.RI.1.1,3 LAFS.910.SL1.1,2,3 LAFS.910.W.3.7,8,9	
08.03 Draw site plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G-SRT.1.1,2	
08.04 Draw floor plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
08.05 Draw interior and exterior elevations.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
08.06 Draw roof plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
08.07 Prepare door/ window schedules.	MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
08.08 Draw wall sections.	LAFS.910.L.3.6 LAFS.910.SL.1.2 LAFS.910.SL.2.4,5,6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
08.09 Draw plot plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
08.10 Draw electrical plan.	LAFS.910.L.3.6 LAFS.910.SL.1.2 LAFS.910.SL.2.4,5,6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
08.11 Review and revise plans throughout the design process to refine and achieve design objective.	LAFS.910.W.3.7,8,9	
08.12 Demonstrate flexibility and adaptability throughout the design process.	LAFS.910.W.2.5,6,7,8,9	
08.13 Define a basic project materials list.		
08.14 Calculate a basic project quantity take-off.		
09.0 Perform basic computer aided drafting functions--The student will be able to:		
09.01 Demonstrate organizational skills to influence the sequential process when creating drawings.	LAFS.910.RI.1.1	
09.02 Construct geometric figures of lines, splines, circles and arcs.	LAFS.910.L.3.6 LAFS.910.W.2.5,6 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2	
09.03 Create and edit text using appropriate style and size to annotate drawings.	LAFS.910.L.3.6 LAFS.910.W.2.5,6	
09.04 Use control accuracy enhancement tools for entity positioning methods such as snap and XYZ.	LAFS.910.L.3.6 LAFS.910.W.2.6	
09.05 Use editing commands.	LAFS.910.L.3.6 LAFS.910.W.2.5,6	
09.06 Use viewing commands to perform zooming and panning.	LAFS.910.L.3.6 LAFS.910.W.2.6	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
09.07 Plot drawings on media using layout and scale.	LAFS.910.L.3.6 LAFS.910.W.2.6 MAFS.912.G-MG.1.3 MAFS.912.G-SRT.1.1	
09.08 Use query commands to interrogate database for entity characteristics, distance, area and status.	LAFS.910.L.3.6 LAFS.910.W.2.6	
09.09 Apply standard dimensioning rules.	LAFS.910.L.3.6 LAFS.910.W.2.6 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,3	
09.10 Move, stretch and offset objects.	LAFS.910.L.3.6 LAFS.910.W.2.6	
09.11 Create a radius between objects.	LAFS.910.L.3.6 LAFS.910.W.2.6 MAFS.912.G-C.1.2	
09.12 Trim and extend objects.	LAFS.910.L.3.6 LAFS.910.W.2.6	
09.13 Break and join objects.	LAFS.910.L.3.6 LAFS.910.W.2.6	
09.14 Create and edit dimensions.	LAFS.910.L.3.6 LAFS.910.W.2.5,6 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,3	
09.15 Change object properties.	LAFS.910.L.3.6 LAFS.910.W.2.5,6	
10.0 Demonstrate understanding of basic civil drawings--The student will be able to:		SC.912.E.6.4; SC.912.L.17.16; SC.912.N.3.5
10.01 Apply use of effective and accurate civil terminology throughout the design process.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10	
10.02 Read and interpret civil drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10	
10.03 Draw plan and profile drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.GMD.2.4 MAFS.912.G-MG.1.1	
10.04 Develop topographic drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.0 Prepare computer aided drawings (CAD)--The student will be able to:		
11.01 Draw a floor plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.02 Draw a site plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.03 Draw exterior and interior elevations.	LAFS.910.L.3.6 LAFS.910.SL.1.2 LAFS.910.SL.2.4,5,6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G- CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G- CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.04 Draw a roof plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G- CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G- CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.05 Prepare door and window schedules.	LAFS.910.L.3.6 LAFS.910.SL.1.2 LAFS.910.SL.2.4,5,6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G- CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.06 Draw a wall section.	LAFS.910.L.3.6 LAFS.910.SL.1.2 LAFS.910.SL.2.4,5 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G- CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G- CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.07 Draw an overall site plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G- CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G- CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.08 Draw a building plot plan.		
11.09 Draw an electrical plan.	LAFS.910.L.3.6 LAFS.910.SL.1.2 LAFS.10.SL.2.4,5,6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4	



CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
		MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
12.0	Research the history of the built environment.		
12.01	Describe the significance of major architects, engineers or inventors to understand their historical influences.	LAFS.910.RI.1.1,2,3 LAFS.910.RI.3.7 LAFS.910.SL.1.1,2,3	
12.02	Research innovative historical architectural and/or engineering works and examine the significance of their legacy for the future.	LAFS.910.RI.1.1,2,3 LAFS.910.RI.3.7 LAFS.910.SL.1.1,2,3	
12.03	Identify transitions in design media, technique and focus to explain how technology has changed design throughout history.	LAFS.910.RI.1.1,2,3 LAFS.910.RI.3.7 LAFS.910.SL.1.1,2,3	

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.

Abbreviations:

FS-M/LA = Florida Standards for Math/Language Arts  
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
13.0 Perform computer aided drafting functions--The student will be able to:		
13.01 Draw lines, arcs, circles, etc. to represent plans and/or mechanical assemblies.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
13.02 Create text styles, text justification and multi-line text.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.03 Create and use multi-leaders.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.04 Edit dimensions.	LAFS.1112.L.3.6 LAFS.1112.W.2.5,6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
13.05 Work with dimension styles.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.06 Crosshatch objects.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.07 Apply external references.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.08 Isolate and hide objects.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.09 Use selection set methods.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.10 Use rectangular and polar arrays.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.11 Use rotation reference angles.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-CO.1.5 MAFS.912.F-TF.1.1	
13.12 Use elements of creativity and organizational principles to create visually coherent viewports and layouts.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5 MAFS.912.G-CO.4.12 MAFS.912.G-SRT.1.1	
13.13 Create and manage layers.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
13.14 Use page setup for plotting.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-SRT.1.1	
13.15 Create, insert and edit reusable content such as symbols and blocks.	LAFS.1112.L.3.6 LAFS.1112.W.2.5,6 LAFS.1112.W.4.10	
13.16 Use specific line types.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.17 Create fills and gradients.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.18 Edit hatch patterns and fills.	LAFS.1112.L.3.6 LAFS.1112.W.2.5,6 LAFS.1112.W.4.10	
14.0 Describe the importance of professional ethics and legal responsibilities in the design and construction industry--The student will be able to:		SC.912.E.7.8; SC.912.L.17.13; SC.912.N.4.1, 2
14.01 Evaluate and justify decisions based on ethical reasoning.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.8	
14.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities and employer policies.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.8	
14.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.8	
14.04 Interpret and explain written organizational policies and procedures.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.8	
14.05 Demonstrate personal responsibility, ethics and integrity, including respect for intellectual property, when accessing information and creating design projects.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.8	
15.0 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:		
15.01 Identify and demonstrate positive work behaviors needed to be employable.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.7,8	
15.02 Develop and use criteria to select works for a digital career portfolio.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.7,8	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
15.03 Evaluate and compare employment opportunities that match career goals.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.7,8	
15.04 Examine licensing, certification, education and industry credentialing requirements for careers in design and construction industry.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.7,8	
15.05 Identify opportunities and research requirements for career advancement.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.7,8	

**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
16.0 Apply three-dimensional modeling concepts--The student will be able to:		
16.01 Use coordinate systems to locate objects in three dimensional space.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.N-VM.1.1 MAFS.912.N-VM.2.4,5	
16.02 Use basic geometric shapes available in two-dimensional and three-dimensional modeling software.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2	
16.03 Define the parameters used for determining size, placement and orientation of a modeling object.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2	
16.04 Describe the Boolean modeling operations of union, subtraction and intersection.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-GMD.1.1 MAFS.912.N-Q.1.1,2,3	

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSS-Sci</b>
16.05	Demonstrate extrusion or sweeping techniques that transform two-dimensional objects into three-dimensional objects.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.06	Describe the 'revolve' or 'lathe' techniques for animating a two-dimensional object and give examples of their application.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.07	Use scale, rotate and move actions that comprise the transformation technique for animating a three-dimensional object.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.08	Use basic viewing navigation tools such as zoom, rotate and panning.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.09	Work with materials, techniques and processes through practice and perseverance to create desired result in two-dimensional and three-dimensional models.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.10	Analyze challenges and identify solutions for three-dimensional design problems.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.11	Investigate the use of space, scale and environmental features within a model to create three-dimensional form or the illusion of depth and form.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.12	Apply materials, ideas, images and/or equipment from other content areas to generate ideas and processes for the development of three-dimensional models.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.13	Investigate the use of various technology, software and media design to reflect creative trends in visual culture.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
17.0	Explain three-dimensional modeling--The students will be able to:		
17.01	Define three-dimensional modeling.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8 MAFS.912.CO.1.1,2,3,4,5 MAFS.912.CO.2.6,7,8	
17.02	Describe the polygonal, non-uniform rational b-spline (NURBS), splines and patches and primitives of three-dimensional modeling.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8 MAFS.912.CO.1.1,2,3,4,5 MAFS.912.CO.2.6,7,8	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
17.03 Describe the constructive solid geometry method of three-dimensional modeling.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8 MAFS.912.CO.1.1,2,3,4,5 MAFS.912.CO.2.6,7,8	
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.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	
18.02 Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	
18.03 Research and recommend sustainable design solutions.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	
18.04 Identify specific design practices that can lessen adverse impacts on the environment.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	
18.05 Explain the environmentally sustainable features of a building.	LAFS.1112.RI.3.8 LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	



**Florida Department of Education  
Student Performance Standards**

**Course Title:** Structural 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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: NGSSS-Sci.*

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
19.0 Investigate the surveying and mapping profession-- The student will be able to:		
19.01 Understand the role of the surveyor/ mapper.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
19.02 Understand the historical significance of surveying/ mapping.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
19.03 Compare and analyze traditional and digital media to learn how technology has altered opportunities for innovative responses and results.	LAFS.1112.RI.3.8 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	
19.04 Understand the surveyor’s role and function today.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
19.05 Investigate surveying and mapping practices in the United States.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
19.06 Describe sections/ townships, ranges, metes and bounds and plats.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
19.07 Use legal descriptions.	LAFS.1112.L.3.6 LAFS.1112.W.1.2:A,B,	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	C,D,E LAFS.1112.W.2.4,5,6 LAFS.1112.W.4.10	
19.08 Understand Florida's laws for surveying and mapping.	LAFS.1112.RI.3.8 LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.3.7,8	
19.09 Identify the types and purposes of surveys (i.e. boundary, topographic, as-built, etc.)	LAFS.1112.L.3.6 LAFS.1112.RI.2.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
19.10 Use technology to facilitate creative process and techniques.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
19.11 Investigate the use of various technologies and resources to inspire creative design.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8,9 LAFS.1112.W.4.10	
20.0 Conduct survey measurements-- The student will be able to:		
20.01 Measure horizontal distances.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.N-Q.1.3	
20.02 Measure angles.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.F-TF.1.1	
20.03 Measure vertical distances (leveling procedure).	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.N-Q.1.3	
20.04 Identify types of equipment used for horizontal measurement.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
20.05 Identify types of equipment for vertical measurement.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
20.06 Use and calculate survey bearings.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.F-TF.1.1 MAFS.912.N-VM.1.1	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	MAFS.912.N-VM.2.4	
21.0 Design and draft map drawings-- The student will be able to:		
21.01 Prepare traverse drawings.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-CO.1.1,2,3,4,5	
21.02 Prepare plat drawings.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-MG.1.1	
21.03 Prepare street layout drawings.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-MG.1.1	
21.04 Prepare map drawings.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-MG.1.1	
22.0 Design and draft computer aided map details-- The student will be able to:		
22.01 Draft range, section and township map.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-MG.1.1	
22.02 Prepare a map using bearings.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.F-TF.1.1 MAFS.912.N-VM.1.1 MAFS.912.N-VM.2.4	
22.03 Prepare a map using coordinates.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-GPE.2.7	
22.04 Convert map into metric dimensions.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.N-Q.1.1,2,3	
22.05 Prepare a map using a Triangulated Irregular Network (TIN).	LAFS.1112.L.3.6 LAFS.1112.W.2.6	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	LAFS.1112.W.4.10	
22.06 Prepare a map using contour lines.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
23.0 Prepare surveying and mapping drawings-- The student will be able to:		
23.01 Use appropriate line work in a drawing.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
23.02 Prepare drawings that include lot lines, easements, setbacks and building lines.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
23.03 Prepare a platted residential lot survey.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
23.04 Prepare multi-lot plat drawings with roadway networks.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2 MAFS.912.G-SRT.4.11	
23.05 Prepare topographic survey with ground elevations.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.7 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
23.06 Prepare computer aided drawing with Triangulated Irregular Network (TIN).	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	CO.4.12.13 MAFS.912.G-SRT.1.1,2 MAFS.912.G-SRT.4.11	

**Florida Department of Education  
Student Performance Standards**

**Course Title:** Structural 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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
24.0 Investigate the use of aerial photography in surveying and mapping-- The student will be able to:		
24.01 Demonstrate knowledge of aerial imagery use and interpretation.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
24.02 Demonstrate knowledge of jurisdictional wetland mapping using aerial photography.	LAFS.1112.RI.3.8 LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.3.7,8	
24.03 Demonstrate knowledge of jurisdictional wetland mapping using field collected points.	LAFS.1112.RI.3.8 LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	
25.0 Conduct surveying and mapping procedures--The student will be able to:		
25.01 Employ basic mapping specifications.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
25.02 Interpret aerial photogrammetry.	LAFS.1112.L.3.6 LAFS.1112.RI.4.10 LAFS.1112.W.2.6 LAFS.1112.W.4.10	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
25.03 Employ horizontal measures.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.N-Q.1.3 MAFS.912.G-CO.1.1	
25.04 Employ leveling procedures.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
25.05 Obtain angular measurements.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.F-TF.1.1	
25.06 Interpret legal descriptions.	LAFS.1112.L.3.6 LAFS.1112.RI.4.10 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
26.0 Design and draft basic civil drawings--The student will be able to:		
26.01 Compare structural designs to understand how technical and utilitarian components impact aesthetic qualities.	LAFS.1112.L.3.6 LAFS.1112.RI.4.10 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
26.02 Apply rules of convention to create purposeful design.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
26.03 Analyze the capacity of the visual arts to fulfill aesthetic needs through civil engineering structures and utilitarian objects.	LAFS.1112.L.3.6 LAFS.1112.RI.4.10 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
26.04 Prepare topographic drawings.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.7 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	



CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
<p>26.05 Prepare drainage drawings.</p>	<p>LAFS.1112.L.3.6  LAFS.1112.W.2.6  LAFS.1112.W.4.10  MAFS.912.G-C.1.1,2,3,4  MAFS.912.G-CO.1.1,2,3,4,5  MAFS.912.G-CO.2.6,7  MAFS.912.G-CO.4.12,13  MAFS.912.G-GPE.2.7  MAFS.912.G-MG.1.1  MAFS.912.G-GPE.2.5,6,7  MAFS.912.G-SRT.1.1,2  MAFS.912.N-Q.1.1,2,3</p>	
<p>26.06 Prepare highway/ corridor drawings.</p>	<p>LAFS.1112.L.3.6  LAFS.1112.W.2.6  LAFS.1112.W.4.10  MAFS.912.G-C.1.1,2,3,4  MAFS.912.G-CO.1.1,2,3,4,5  MAFS.912.G-CO.2.6,7  MAFS.912.G-CO.4.12,13  MAFS.912.G-GPE.2.7  MAFS.912.G-MG.1.1  MAFS.912.G-GPE.2.5,6,7  MAFS.912.G-SRT.1.1,2  MAFS.912.N-Q.1.1,2,3</p>	
<p>26.07 Prepare utility detail map that includes storm drainage structures and corresponding drainage pipes.</p>	<p>LAFS.1112.L.3.6  LAFS.1112.W.2.6  LAFS.1112.W.3.7,8,9  LAFS.1112.W.4.10  MAFS.912.G-C.1.1,2,3,4  MAFS.912.G-CO.1.1,2,3,4,5  MAFS.912.G-CO.2.6,7  MAFS.912.G-CO.4.12,13  MAFS.912.G-GPE.2.7  MAFS.912.G-MG.1.1  MAFS.912.G-GPE.2.5,6,7</p>	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
26.08 Prepare utility detail map that includes water distribution and sanitary sewer pipes along with fittings for each system.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.7 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
26.09 Prepare utility detail map that includes as-builts of stormwater, water distribution and sanitary sewer systems.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.7 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
26.10 Prepare roadway cross section maps.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.7 MAFS.912.G-MG.1.1 MAFS.912.G-	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
26.11 Prepare computer aided drawing and calculations.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.7 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
27.0 Prepare presentation drawings--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.	LAFS.1112.SL.1.1,2,3 LAFS.1112.SL.2.4,5,6	
27.02 Concentrate on a particular style, theme or concept to compile content for a portfolio, display or exhibition.	LAFS.1112.SL.1.1,2,3 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.3.7,8,9	
27.03 Process and apply constructive criticism as formative assessment for continued creative growth.	LAFS.1112.SL.1.1,2,3	
27.04 Develop a presentation of digital portfolio to interview and/ or apply for a drafting-related position or educational program.	LAFS.1112.SL.1.1,2,3 LAFS.1112.SL.2.4,5,6	

## **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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

SkillsUSA is the intercurricular 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.

### **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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different

competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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, 30, 31
Standard Length	5 Credits
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-3012 - Helpers—Carpenters 51-7011 - Cabinetmakers and Bench Carpenters

**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 consisting of three occupational completion points. The recommended sequence allows students to complete specified portions of the program for employment or to remain for additional 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.

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:

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

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

### Academic Alignment Tables

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science 1	Marine Science 1 Honors	Physical Science	Physics 1
8104410	6/87 7%	8/80 10%	25/83 30%	9/69 13%	25/67 37%	4/70 6%	7/69 10%	27/82 33%	7/66 11%	27/74 36%	8/72 11%
8104420	3/87 3%	4/80 5%	26/83 31%	4/69 6%	24/67 36%	4/70 6%	5/69 7%	25/82 30%	5/66 8%	24/74 32%	4/72 6%
8104430	22/87 25%	23/80 29%	4/83 5%	23/69 33%	4/67 6%	21/70 30%	23/69 33%	5/82 6%	18/66 27%	4/74 5%	23/72 32%
8720140	#	#	#	#	#	#	#	#	#	#	#
8720150	#	#	#	#	#	#	#	#	#	#	#

# Alignment attempted, but no correlation to academic course

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8104410	14/67 21%	14/75 19%	15/54 28%	4/46 9%	4/45 9%	#	#
8104420	16/67 24%	9/75 12%	14/54 26%	8/46 17%	8/45 18%	#	#

8104430	11/67 16%	12/75 16%	9/54 17%	#	#	#	#
8720140	#	#	#	#	#	2/45 4%	2/45 4%
8720150	#	#	#	#	#	#	#

# Alignment attempted, but no correlation to academic course

### **Florida Standards for Technical Subjects**

*Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education.*

**Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.**

### **Florida Standards for English Language Development (ELD)**

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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.



## **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 Create basic construction drawings and/or sketches.
- 05.0 Recommend appropriate building materials for specific scenarios.
- 06.0 Select appropriate fasteners and hardware for specific scenarios.
- 07.0 Apply occupational safety skills.
- 08.0 Select and use hand and power tools relevant to the cabinetmaking profession.
- 09.0 Fasten stock and joints.
- 10.0 Read and design construction documents.
- 11.0 Install cabinets and components.
- 12.0 Investigate sustainability issues related to the cabinetmaking profession.
- 13.0 Identify and describe interior and exterior doors (wood and/or metal).
- 14.0 Install trim and finish carpentry using plans and specifications.
- 15.0 Assemble cabinet doors.
- 16.0 Install ceramic tile.
- 17.0 Install various countertop surfaces.
- 18.0 Explain the importance of employability and entrepreneurship skills.
- 19.0 Prepare cabinets for finish.
- 20.0 Apply finishes.
- 21.0 Install cabinets.
- 22.0 Apply laminates.

**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		SC.912.N.1.1
02.02 Select correct tools for specific jobs.		SC.912.N.1.1
02.03 Clean and care for tools and equipment.		
02.04 Demonstrate proficiency in the safe use of hand and power tools.		

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
02.05	Read and use carpenter's measuring tools.	MAFS.912.G-GMD.2.4 MAFS.912.N.-Q.1.1,2,3	SC.912.N.1.1
03.0	Demonstrate mathematics knowledge and skills relevant to the cabinetmaking field--The student will be able to:		
03.01	Apply geometry and algebra skills to solve math problems related to cabinetmaking with and without a calculator.	MAFS.912.G-CO.4.12 MAFS.912.G-SRT.1.1,2 MAFS.912.N.-Q.1.2,3	
03.02	Demonstrate knowledge of arithmetic operations.	MAFS.912.N.-Q.1.1,2,3	
03.03	Solve problems for distance, perimeter, area and volume.	MAFS.912.N-CN.2.6 MAFS.912.G.GMD.1.3 MAFS.912.G.GMD.2.4 MAFS.912.G.MG.1.1,3 MAFS.912.N.-Q.1.1,2,3	
03.04	Analyze and apply data and measurements to solve problems and interpret documents.	MAFS.912.S-IC.1.1 MAFS.912.S-IC.2.5,6 MAFS.912.N.-Q.1.1,2,3 LAFS.910.RI.1.1,3	
03.05	Construct charts/tables/graphs using functions and data.	MAFS.912.F-IF.2.4 MAFS.912.F-IF.3.9 MAFS.912.N.-Q.1.1,2,3	
04.0	Create basic construction drawings and/or sketches--The student will be able to:		
04.01	Recognize and identify basic construction drawing terms, components and symbols.	LAFS.910.RI.2.4	
04.02	Relate information on construction drawings to actual locations on the print.		SC.912.N.3.5
04.03	Recognize different classifications of construction drawings.		SC.912.N.3.5
04.04	Interpret and use drawing dimensions and architectural scales.	MAFS.912.N.-Q.1.1,2,3 MAFS.912.G-MG.1.3 MAFS.912.G.-SRT.1.1,2	SC.912.N.3.5
05.0	Recommend appropriate building materials for specific scenarios--The student will be able to:		
05.01	Identify the grades and species of lumber and their appropriate uses.		SC.912.N.1.1, SC.912.L.15.4 SC.912.L.14.7
05.02	Identify the actual and nominal sizes of lumber.		SC.912.N.1.1
05.03	Identify the grades of plywood and wood products.		SC.912.N.1.1, SC.912.L.15.4 SC.912.L.14.7
05.04	Identify defects and blemishes that affect the durability and strength of lumber.		SC.912.N.1.1 SC.912.L.14.7

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
05.05 Explain the effects of temperature extremes, chemical reaction and moisture content on building materials.	LAFS.910.SL.2.4	SC.912.N.1.1 SC.912.P.10.4,5,1 2 SC.912.P.18.12
05.06 Explain the uses of various types of engineered lumber.	LAFS.910.SL.2.4	SC.912.N.1.1
06.0 Select appropriate fasteners and hardware for specific scenarios --The student will be able to:		
06.01 Identify the fasteners commonly used in cabinetmaking.		SC.912.N.1.1
06.02 Identify the hardware commonly used in cabinetmaking.		SC.912.N.1.1

**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
07.0 Apply occupational safety skills--The student will be able to:		
07.01 Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200)	LAFS.910.W.2.4	
07.02 Explain the purpose of the Occupational Safety and Health Administration (OSHA).	LAFS.910.W.2.4	
07.03 Identify health-related problems that may result from exposure to hazardous materials.	LAFS.910.W.2.4	
07.04 Describe the proper precautions for handling hazardous materials.	LAFS.910.W.2.4	
07.05 Explain eligibility and the procedures for obtaining worker's compensation.	LAFS.910.W.2.4	
07.06 Explain the importance of complying with the Americans with Disabilities Act (ADA) requirements.	LAFS.910.W.2.4	
08.0 Select and use hand and power tools relevant to the cabinetmaking profession--The student will be able to:		
08.01 Identify the hand tools commonly used by carpenters and describe their uses.		SC.912.N.1.1
08.02 Use hand tools in a safe and appropriate manner.		SC.912.N.1.1
08.03 State the general safety rules for operating all power tools, regardless of type.	LAFS.910.SL.2.4	
08.04 State the general rules for properly maintaining all power tools, regardless of type.	LAFS.910.SL.2.4	

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
08.05	Identify the portable power tools commonly used by carpenters and describe their uses.		SC.912.N.1.1
08.06	Use portable power tools in a safe and appropriate manner.		SC.912.N.1.1
09.0	Fasten stock and joints--The student will be able to:		
09.01	Identify types of glues and fasteners and describe their applications.	LAFS.910.W.2.4	SC.912.N.1.1
09.02	Fasten stock with glue and clamps.		
09.03	Fasten stock and joints with appropriate fasteners such as nails, staples, screws and bolts.		SC.912.N.1.1
09.04	Fill and finish nail and screw holes with fillers and plugs.		
09.05	Glue and clamp stock using various techniques.		SC.912.N.1.1
10.0	Read and design construction documents--The student will be able to:		
10.01	Explain the types of drawings usually included in a set of plans and list the information found on each type.	LAFS.910.W.2.4 LAFS.910.SL.2.4	SC.912.N.3.5
10.02	Identify the different types of lines used on construction drawings.		SC.912.L.15.4
10.03	Identify selected abbreviations commonly used on plans.	LAFS.910.RI.2.4	SC.912.N.1.1 SC.912.N.3.5
10.04	Read and interpret plans, elevations, schedules, sections and details contained in basic construction drawings.	MAFS.912.N.-Q.1.1,2,3 LAFS.910.RI.1.1,3	
10.05	State the purpose of written specifications.	LAFS.910.SL.2.4	
10.06	Identify and describe the parts of a specification.	LAFS.910.W.2.4 LAFS.910.SL.2.4	SC.912.N.1.1
10.07	Conduct quantity takeoff for materials.	MAFS.912.N.-Q.1.1,2,3 MAFS.912.G-MG.1.3	
10.08	Design millwork and draw details in construction documents for a given scenario.		SC.912.N.1.1
11.0	Install cabinets and components--The student will be able to:		
11.01	Install hardware such as hinges, catches, pulls, knobs and guides on assembled cabinets.		
11.02	Install fasteners.		
11.03	Install drawers.		
11.04	Install various types of doors including overlay, lipped and flush.		

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
11.05 Install adjustable shelving.		
11.06 Install glass panels and metal grills.		
11.07 Install specialty hardware such as a lazy Susan, wire racks and “pull-outs”.		
11.08 Install sliding doors and track.		
12.0 Investigate sustainability issues related to the cabinetmaking professions--The student will be able to:		
12.01 Describe the impact of the construction industry on the natural environment.	LAFS.910.W.3.7 LAFS.910.W.1.2	SC.912.L.17.8, SC.912.L.17.20
12.02 Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.	LAFS.910.W.3.7 LAFS.910.W.1.2	SC.912.L.17.8, SC.912.L.17.20
12.03 Recommend sustainable alternatives to conventional cabinetmaking practices.	LAFS.910.W.3.7 LAFS.910.W.1.2	SC.912.N.1.1, SC.912.L.17.20
12.04 Identify specific practices that can lessen adverse impacts on the environment.	LAFS.910.W.3.7 LAFS.910.W.1.2	SC.912.N.1.1 SC.912.L.17.8 SC.912.L.17.20
12.05 Investigate building assessment tools such as Leadership in Energy and Environmental Design (LEED).	LAFS.910.W.3.7 LAFS.910.W.1.2	SC.912.N.1.1
12.06 Assess construction activities pertaining to the cabinetmaking profession that contribute to a project’s overall sustainability.	LAFS.910.SL.1.1	SC.912.N.1.1 SC.912.L.17.20



**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..

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
13.0	Identify and describe interior and exterior doors (wood and/or metal)--The student will be able to:		
13.01	Identify the types and parts of door systems.		SC.912.N.1.1 SC.912.L.15.4
13.02	Identify door jamb components.		SC.912.N.1.1
13.03	Identify door hardware.		
14.0	Install trim and finish carpentry using plans and specifications --The student will be able to:		
14.01	Read an architect's scale to determine measurements for a trim and finish carpentry job.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-SRT.1.1	SC.912.N.3.5
14.02	Cut and apply trim such as crown molding, baseboard, door and window molding, wainscoting and chair rail.		
15.0	Assemble cabinet doors--The student will be able to:		
15.01	Select appropriate tools and materials for project.		
15.02	Cut and glue rails, stiles and panels.		
15.03	Select appropriate hinges and door pulls for installation.		
16.0	Install ceramic tile--The student will be able to:		

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSS-Sci</b>
16.01 Select appropriate tools and materials for project.		
16.02 Prepare surfaces for tile installation.		
16.03 Layout, cut and install tile backsplash.		
16.04 Patch and repair tile affected by cabinet renovation project.		
17.0 Install various countertop surfaces--The student will be able to:		
17.01 Install stone (granite, quartz or marble) countertop.		
17.02 Install solid surface countertop.		
17.03 Install tile countertop.		
17.04 Install wood countertop.		
17.05 Install stainless steel countertop.		
17.06 Install plastic laminate countertop.		

**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
18.0	Explain the importance of employability and entrepreneurship skills--The student will be able to:		
18.01	Identify and demonstrate positive work behaviors needed to be employable.		
18.02	Develop personal career plan that includes goals, objectives and strategies.	LAFS.1112.W.3.7	
18.03	Examine licensing, certification and industry credentialing requirements.	LAFS.1112.W.3.7 LAFS.1112.RI.1.1	
18.04	Maintain a career portfolio to document knowledge, skills and experience.		
18.05	Evaluate and compare employment opportunities that match career goals.		
18.06	Identify and exhibit traits for retaining employment.		
18.07	Identify opportunities and research requirements for career advancement.	LAFS.1112.W.3.7	
18.08	Research the benefits of ongoing professional development.	LAFS.1112.W.3.7	
18.09	Examine and describe entrepreneurship opportunities as a career planning option.	LAFS.1112.W.3.7 LAFS.1112.RI.1.1	
19.0	Prepare cabinets for finish--The student will be able to:		
19.01	Fill nail and screw holes.		

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
19.02 Install wood plugs in prepared holes.		
19.03 Sand a cabinet and joints for finish.		
19.04 Select and apply proper filler.		
19.05 Sand wood surfaces for finishing.		
19.06 Stain, bleach, fill and seal wood surfaces as needed.		
20.0 Apply finishes--The student will be able to:		
20.01 Apply various types of finishes including lacquer-based, water-based, oil-based, enamel and polyurethane.		
20.02 Apply the types of finishes that the local market demands.		
20.03 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 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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
21.0 Install cabinets--The student will be able to:		
21.01 Load and secure casework for hauling.		
21.02 Check walls and floors for level and plumb.		
21.03 Determine fasteners for block or walls.		
21.04 Install upper and lower cabinets and other casework.		
21.05 Fasten a suspended cabinet unit to ceiling.		
21.06 Install countertops, including sink cutouts and back splash.		
21.07 Cut and install molding and trim.		
21.08 Adjust doors and drawers.		
21.09 Clean work site.		
22.0 Apply laminates--The student will be able to:		
22.01 Lay out and cut core stock to specifications.		
22.02 Lay out and cut laminate to specification.		

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
22.03 Apply adhesive.		
22.04 Apply laminate to core stock.		
22.05 Trim and file plastic laminate edges.		
22.06 Clean laminated surfaces.		
22.07 Laminate a curved surface.		
22.08 Repair laminate defects.		

## **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.

### **Special Notes**

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the postsecondary program with the same Classification of Instructional Programs (CIP) number.

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

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



Florida Department of Education  
Curriculum Framework

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

**Secondary – Career Preparatory**

Program Number	8104500
CIP Number	0646020115
Grade Level	9-12, 30, 31
Standard Length	7 Credits
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-3012 – Helpers--Carpenters 47-2031- Carpenters

**Purpose**

The purpose of this program is to prepare students for employment in the carpentry 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 cabinetmaking skills, as well as 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. The recommended sequence allows students to complete specified portions of the program for employment or to remain for additional 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.

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:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
A	8104510	Carpentry 1	CAB WOODWK @7 7G CARPENTRY @7 7G BLDG CONST @7 7G TEC CONSTR @7 7G	1 Credit	47-3012	2	VO
	8104520	Carpentry 2		1 Credit	47-3012	2	PA
B	8104530	Carpentry 3		1 Credit	47-2031	3	VO
	8722140	Carpentry 4		1 Credit	47-2031	3	VO
C	8722150	Carpentry 5		1 Credit	47-2031	3	VO
	8722160	Carpentry 6		1 Credit	47-2031	3	VO
	8722170	Carpentry 7		1 Credit	47-2031	3	VO

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

### Academic Alignment Tables

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth- Space Science	Environmental Science	Genetics	Integrated Science 1	Marine Science 1 Honors	Physical Science	Physics 1
8104510	6/87 7%	8/80 10%	25/83 30%	9/69 13%	25/67 37%	4/70 6%	7/69 10%	27/82 33%	7/66 11%	27/74 36%	8/72 11%
8104520	3/87 3%	4/80 5%	26/83 31%	4/69 6%	24/67 36%	4/70 6%	5/69 7%	25/82 30%	5/66 8%	24/74 32%	4/72 6%
8104530	23/87 26%	24/80 30%	4/83 5%	24/69 35%	4/67 6%	22/70 31%	24/69 35%	5/82 6%	19/66 29%	4/74 5%	24/72 33%
8722140	23/87 26%	23/80 29%	6/83 7%	24/69 35%	3/67 4%	22/70 31%	24/69 35%	5/82 6%	20/66 30%	4/74 5%	23/72 32%
8722150	1/87 1%	2/80 3%	2/83 2%	2/69 3%	2/67 3%	1/70 1%	1/69 1%	4/82 5%	1/66 2%	3/74 4%	2/72 3%
8722160	4/87 5%	6/80 8%	5/83 6%	4/69 6%	6/67 9%	2/70 3%	4/69 6%	7/82 9%	5/66 8%	5/74 7%	6/72 8%
8722170	6/87 7%	0880 10%	4/83 5%	7/69 10%	5/67 7%	4/70 6%	6/69 9%	5/82 7%	6/66 9%	5/74 7%	7/72 10%

# Alignment attempted, but no correlation to academic course

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8104510	14/67 21%	14/75 19%	15/54 28%	4/46 9%	4/45 9%	#	#
8104520	16/67 24%	9/75 12%	14/54 26%	8/46 17%	8/45 18%	#	#
8104530	12/67 18%	15/75 20%	11/54 20%	#	#	2/45 4%	2/45 4%
8722140	13/67 19%	16/75 21%	12/54 22%	#	#	5/45 11%	5/45 11%
8722150	3/67 4%	1/75 1%	6/54 11%	#	#	2/45 4%	2/45 4%
8722160	4/67 6%	2/75 3%	5/54 9%	#	#	4/45 9%	4/45 9%
8722170	3/67 4%	4/75 5%	4/54 7%	#	#	5/45 11%	5/45 11%

# Alignment attempted, but no correlation to academic course

### **Florida Standards for Technical Subjects**

*Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education.*

**Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.**

### **Florida Standards for English Language Development (ELD)**

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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.

## **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 carpentry profession.
- 03.0 Demonstrate mathematics knowledge and skills relevant to the carpentry field.
- 04.0 Create basic construction drawings and/or sketches.
- 05.0 Recommend appropriate building materials for specific scenarios.
- 06.0 Select appropriate fasteners and hardware for specific scenarios.
- 07.0 Apply occupational safety skills.
- 08.0 Select and use hand and power tools relevant to the carpentry profession.
- 09.0 Fasten stock and joints.
- 10.0 Read and design construction documents.
- 11.0 Install cabinets and components.
- 12.0 Investigate sustainability issues related to the carpentry professions.
- 13.0 Identify and describe interior and exterior doors (wood and/or metal).
- 14.0 Install trim and finish carpentry using plans and specifications.
- 15.0 Cut and install framing members for a floor (wood and/or metal).
- 16.0 Cut and install a wall and partition framing (wood and/or metal).
- 17.0 Install an interior wall and ceiling materials.
- 18.0 Lay out and construct an interior-stair system.
- 19.0 Comply with hurricane codes.
- 20.0 Frame a roof.
- 21.0 Apply roofing applications.
- 22.0 Apply thermal and moisture protection.
- 23.0 Frame walls using cold-formed steel.
- 24.0 Perform site-preparation and layout activities.
- 25.0 Explain the importance of employability and entrepreneurship skills.
- 26.0 Perform concrete tests.
- 27.0 Lay foundations.
- 28.0 Construct vertical formwork.
- 29.0 Construct horizontal formwork.
- 30.0 Erect and properly align tilt-up wall panels.
- 31.0 Install drywall.
- 32.0 Install a suspended ceiling.
- 33.0 Interpret door and door hardware requirements based on plans and specifications.
- 34.0 Install windows and exterior doors.
- 35.0 Apply interior trim.
- 36.0 Lay out and construct an exterior stair system.
- 37.0 Apply exterior finishing.

- 38.0 Set up and install basic rigging and scaffolding.
- 39.0 Erect, plumb and brace a simple concrete form with reinforcement.
- 40.0 Explain and demonstrate how to place reinforcing bars in walls, columns, beams, girders, joists and slabs.
- 41.0 Explain the transport and placement of concrete.
- 42.0 Demonstrate an understanding of trenching and excavation.

**Florida Department of Education  
Student Performance Standards**

**Course Title:** Carpentry 1  
**Course Number:** 8104510  
**Course Credit:** 1

**Course Description:**

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

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
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 carpentry profession--The student will be able to:		
02.01 Identify various hand and power tools.		SC.912.N.1.1
02.02 Select correct tools for specific jobs.		SC.912.N.1.1
02.03 Clean and care for tools and equipment.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
02.04 Demonstrate proficiency in the safe use of hand and power tools.		
02.05 Read and use carpenter's measuring tools.	MAFS.912.G-GMD.2.4 MAFS.912.N.-Q.1.1,2,3	SC.912.N.1.1
03.0 Demonstrate mathematics knowledge and skills relevant to the carpentry field--The student will be able to:		
03.01 Apply geometry and algebra skills to solve math problems related to carpentry and/or cabinetmaking with and without a calculator.	MAFS.912.G-CO.4.12 MAFS.912.G-SRT.1.1,2 MAFS.912.N.-Q.1.2,3	
03.02 Demonstrate knowledge of arithmetic operations.	MAFS.912.N.-Q.1.1,2,3	
03.03 Solve problems for distance, perimeter, area and volume.	MAFS.912.N-CN.2.6 MAFS.912.G.GMD.1.3 MAFS.912.G.GMD.2.4 MAFS.912.G.MG.1.1,3 MAFS.912.N.-Q.1.1,2,3	
03.04 Analyze and apply data and measurements to solve problems and interpret documents.	MAFS.912.S-IC.1.1 MAFS.912.S-IC.2.5,6 MAFS.912.N.-Q.1.1,2,3 LAFS.910.RI.1.1,3	
03.05 Construct charts/tables/graphs using functions and data.	MAFS.912.F-IF.2.4 MAFS.912.F-IF.3.9 MAFS.912.N.-Q.1.1,2,3	
04.0 Create basic construction drawings and/or sketches--The student will be able to:		
04.01 Recognize and identify basic construction drawing terms, components and symbols.	LAFS.910.RI.2.4	
04.02 Relate information on construction drawings to actual locations on the print.		SC.912.N.3.5
04.03 Recognize different classifications of construction drawings.		SC.912.N.3.5
04.04 Interpret and use drawing dimensions and architectural scales.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G.-SRT.1.2 MAFS.912.G-MG.1.3 MAFS.912.G.-SRT.1.1	SC.912.N.3.5
05.0 Recommend appropriate building materials for specific scenarios--The student will be able to:		
05.01 Identify the grades and species of lumber and their appropriate uses.		SC.912.N.1.1, SC.912.L.15.4 SC.912.L.14.7
05.02 Identify the actual and nominal sizes of lumber.		SC.912.N.1.1
05.03 Identify the grades of plywood and wood products.		SC.912.N.1.1, SC.912.L.15.4



CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
		SC.912.L.14.7
05.04 Identify defects and blemishes that affect the durability and strength of lumber.		SC.912.N.1.1 SC.912.L.14.7
05.05 Explain the effects of temperature extremes, chemical reaction and moisture content on building materials.	LAFS.910.SL.2.4	SC.912.N.1.1 SC.912.P.8.12 SC.912.P.10.4,5,12
05.06 Explain the uses of various types of engineered lumber.	LAFS.910.SL.2.4	SC.912.N.1.1
06.0 Select appropriate fasteners and hardware for specific scenarios --The student will be able to:		
06.01 Identify the fasteners commonly used in carpentry and/or cabinetmaking.		SC.912.N.1.1
06.02 Identify the hardware commonly used in carpentry and/or cabinetmaking.		SC.912.N.1.1

**Florida Department of Education  
Student Performance Standards**

**Course Title:** Carpentry 2  
**Course Number:** 8104520  
**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 safety, hand and power tools, fastening methods, cabinet assembly and plan reading.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
07.0 Apply occupational safety skills--The student will be able to:		
07.01 Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200)	LAFS.910.W.2.4	
07.02 Explain the purpose of the Occupational Safety and Health Administration (OSHA).	LAFS.910.W.2.4	
07.03 Identify health-related problems that may result from exposure to hazardous materials.	LAFS.910.W.2.4	
07.04 Describe the proper precautions for handling hazardous materials.	LAFS.910.W.2.4	
07.05 Explain eligibility and the procedures for obtaining worker's compensation.	LAFS.910.W.2.4	
07.06 Explain the importance of complying with the Americans with Disabilities Act (ADA) requirements.	LAFS.910.W.2.4	
08.0 Select and use hand and power tools relevant to the carpentry profession--The student will be able to:		
08.01 Identify the hand tools commonly used by carpenters and describe their uses.		SC.912.N.1.1
08.02 Use hand tools in a safe and appropriate manner.		SC.912.N.1.1
08.03 State the general safety rules for operating all power tools, regardless of type.	LAFS.910.SL.2.4	

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
08.04 State the general rules for properly maintaining all power tools, regardless of type.	LAFS.910.SL.2.4	
08.05 Identify the portable power tools commonly used by carpenters and describe their uses.		SC.912.N.1.1
08.06 Use portable power tools in a safe and appropriate manner.		SC.912.N.1.1
<b>09.0 Fasten stock and joints--The student will be able to:</b>		
09.01 Identify types of glues and fasteners and describe their applications.	LAFS.910.W.2.4	SC.912.N.1.1
09.02 Fasten stock with glue and clamps.		
09.03 Fasten stock and joints with appropriate fasteners such as nails, staples, screws and bolts.		SC.912.N.1.1
09.04 Fill and finish nail and screw holes with fillers and plugs.		
09.05 Glue and clamp stock using various techniques.		SC.912.N.1.1
<b>10.0 Read and design construction documents--The student will be able to:</b>		
10.01 Explain the types of drawings usually included in a set of plans and list the information found on each type.	LAFS.910.W.2.4 LAFS.910.SL.2.4	SC.912.N.3.5
10.02 Identify the different types of lines used on construction drawings.		SC.912.L.15.4
10.03 Identify selected abbreviations commonly used on plans.	LAFS.910.RI.2.4	SC.912.N.1.1 SC.912.N.3.5
10.04 Read and interpret plans, elevations, schedules, sections and details contained in basic construction drawings.	MAFS.912.N.-Q.1.1,2,3 LAFS.910.RI.1.1,3	
10.05 State the purpose of written specifications.	LAFS.910.SL.2.4	
10.06 Identify and describe the parts of a specification.	LAFS.910.W.2.4 LAFS.910.SL.2.4	SC.912.N.1.1
10.07 Conduct quantity takeoff for materials.	MAFS.912.N.-Q.1.1,2,3 MAFS.912.G-MG.1.3	
10.08 Design millwork and draw details in construction documents for a given scenario.		SC.912.N.1.1
<b>11.0 Install cabinets and components--The student will be able to:</b>		
11.01 Install hardware such as hinges, catches, pulls, knobs and guides on assembled cabinets.		
11.02 Install fasteners.		
11.03 Install drawers.		

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
11.04	Install various types of doors including overlay, lipped and flush.		
11.05	Install adjustable shelving.		
11.06	Install glass panels and metal grills.		
11.07	Install specialty hardware such as a lazy Susan, wire racks and “pull-outs”.		
11.08	Install sliding doors and track.		
12.0	Investigate sustainability issues related to the carpentry professions--The student will be able to:		
12.01	Describe the impact of the construction industry on the natural environment.	LAFS.910.W.3.7 LAFS.910.W.1.2	SC.912.L.17.8, SC.912.L.17.20
12.02	Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.	LAFS.910.W.3.7 LAFS.910.W.1.2	SC.912.L.17.8, SC.912.L.17.20
12.03	Recommend sustainable alternatives to conventional carpentry practices.	LAFS.910.W.3.7 LAFS.910.W.1.2	SC.912.N.1.1, SC.912.L.17.20
12.04	Identify specific practices that can lessen adverse impacts on the environment.	LAFS.910.W.3.7 LAFS.910.W.1.2	SC.912.N.1.1 SC.912.L.17.8 SC.912.L.17.20
12.05	Investigate building assessment tools such as Leadership in Energy and Environmental Design (LEED).	LAFS.910.W.3.7 LAFS.910.W.1.2	SC.912.N.1.1
12.06	Assess construction activities pertaining to the carpentry profession that contribute to a project’s overall sustainability.	LAFS.910.SL.1.1	SC.912.N.1.1 SC.912.L.17.20

**Florida Department of Education  
Student Performance Standards**

**Course Title:** Carpentry 3  
**Course Number:** 8104530  
**Course Credit:** 1

**Course Description:**

This course provides students with a more in-depth knowledge of trim and finish carpentry, as well as an introduction to rough carpentry. Students will further their understanding of plan and specifications, assemble and install cabinetry, install doors, frame floors and walls and construct stairs.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
13.0	Identify and describe interior and exterior doors (wood and/or metal)--The student will be able to:		
13.01	Identify the types and parts of door systems.		SC.912.N.1.1 SC.912.L.15.4
13.02	Identify door jamb components.		SC.912.N.1.1
13.03	Identify door hardware.		
14.0	Install trim and finish carpentry using plans and specifications --The student will be able to:		
14.01	Read an architect's scale to determine measurements for a trim and finish carpentry job.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-SRT.1.1	SC.912.N.3.5
14.02	Cut and apply trim such as crown molding, baseboard, door and window molding, wainscoting and chair rail.		
15.0	Cut and install framing members for a floor (wood and/or metal)--The student will be able to:		
15.01	Identify and describe floor-framing members including subfloor.	LAFS.1112.W.2.4 LAFS.1112.SL.2.4	SC.912.N.3.5
15.02	Identify supports for structures (e.g., sills, columns, beams and girders).	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-SRT.1.1	SC.912.N.1.1
15.03	Identify various types of joists and openings, including joists for a cantilevered floor.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-SRT.1.1	SC.912.N.1.1

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
15.04 Identify various types of bridging.		
15.05 Identify various types of subfloors, applying fastening techniques.	LAFS.1112.W.2.4 LAFS.1112.SL.2.4	SC.912.N.3.5
16.0 Cut and install a wall and partition framing (wood and/or metal)--The student will be able to:		
16.01 Identify framing members used in wall and partition construction.		SC.912.L.15.4
16.02 Lay out wall lines and partition locations on a floor.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-SRT.1.1	
16.03 Lay out walls for studs, doors and windows.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-SRT.1.1	
16.04 Identify studs, trimmers, cripples, headers and fire stops to length.	MAFS.912.N-Q.1.1,2,3	
16.05 Identify T's, corners and headers.		
16.06 Identify wall layout.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-SRT.1.1	
16.07 Identify wall sheathing and/or diagonal bracing.		
16.08 Identify and describe insulation materials and a vapor barrier.		
17.0 Install an interior wall and ceiling materials--The student will be able to:		
17.01 Identify and describe furring strips.		
17.02 Identify and describe drywall materials.		
17.03 Identify paneling and trim.		
17.04 Identify ceiling materials and systems.		
18.0 Lay out and construct an interior-stair system--The student will be able to:		
18.01 Identify the types and styles of interior-stair systems.		SC.912.N.3.5 SC.912.N.15.4 SC.912.N.1.1
18.02 Identify the components of an interior-stair system.		SC.912.N.3.5
18.03 Calculate the number of risers and treads for an interior-stair system.	MAFS.912.N-Q.1.1,2,3 MAFS.912.S-ID.3.7 MAFS.912.G-SRT.3.8 MAFS.912.G-SRT.2.4	
18.04 Describe an interior-stair system (rough and finish).	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-SRT.1.1	SC.912.N.1.1

**Florida Department of Education  
Student Performance Standards**

**Course Title:**        **Carpentry 4**  
**Course Number:**   **8722140**  
**Course Credit:**     **1**

**Course Description:**

This course provides students with knowledge and skills pertaining to codes, roof framing and applications, wall framing and site preparation.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
19.0 Comply with hurricane codes--the student will be able to:		
19.01 Install hurricane anchors.		
19.02 Install hurricane clips.		
19.03 Install hurricane straps.		
19.04 Explain the purpose and importance of the codes relating to hurricanes.	LAFS.1112.RI.1.1 LAFS.1112.W.2.4 LAFS.1112.SL.2.4	SC.912.L.17.8
20.0 Frame a roof--The student will be able to:		
20.01 Understand the terms associated with roof framing.	LAFS.1112.RI.2.4	
20.02 Identify the roof framing members used in gable and hip roofs.		
20.03 Identify the methods used to calculate the length of a rafter.		
20.04 Identify the various types of trusses used in roof framing.		
20.05 Use a rafter framing square, speed square and calculator in laying out a roof.	MAFS.912.N-Q.1.1,2,3 MAFS.912.S-ID.3.7	
20.06 Identify various types of sheathing used in roof construction.		
20.07 Frame a gable roof with vent openings.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
20.08 Frame a roof opening.		
20.09 Erect a gable roof using trusses.		
20.10 Estimate the materials used in framing and sheathing a roof.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-MG.1.3	
21.0 Apply roofing applications--The student will be able to:		
21.01 Identify the materials and methods used in roofing.		SC.912.N.1.1 SC.912.L.15.4
21.02 Explain the safety requirements for roof jobs.	LAFS.1112.W.2.4	
21.03 Install fiberglass shingles on gable and hip roofs.		
21.04 Close up a valley using fiberglass shingles.		
21.05 Explain how to make various roof projections watertight when using fiberglass shingles.	LAFS.1112.SL.2.4	
21.06 Complete the proper cuts and install the main and hip ridge caps using fiberglass shingles.		
21.07 Lay out, cut and install a cricket or saddle.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-MG.1.3	
21.08 Install wood shingles and shakes on roofs.		
21.09 Describe how to close up a valley using wood shingles and shakes.	LAFS.1112.SL.2.4	
21.10 Explain how to make roof projections watertight when using wood shakes and shingles.	LAFS.1112.SL.2.4	
21.11 Complete the cuts and install the main and hip ridge caps using wood shakes/shingles.		
21.12 Demonstrate the techniques for installing other selected types of roofing materials.		
22.0 Apply thermal and moisture protection--The student will be able to:		
22.01 Research the requirements for insulation.	LAFS.1112.W.3.7	SC.912.N.1.1
22.02 Identify the characteristics of various types of insulation material.	LAFS.1112.W.3.7	SC.912.N.1.1
22.03 Calculate the required amounts of insulation for a structure.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-MG.1.1	
22.04 Install selected insulation materials.		
22.05 Describe the requirements for moisture control and ventilation.	LAFS.1112.SL.2.4	SC.912.N.1.1 SC.912.L.18.12



<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
22.06	Install selected vapor barriers.		
22.07	Describe various methods of waterproofing.	LAFS.1112.SL.2.4	
22.08	Describe air infiltration control requirements.	LAFS.1112.SL.2.4	
22.09	Install selected building wraps.		
23.0	Frame walls using cold-formed steel--The student will be able to:		
23.01	Identify the components of a steel framing system.		
23.02	Identify and select the tools and fasteners used in a steel framing system.		
23.03	Identify applications for steel framing systems.		
23.04	Demonstrate the ability to build back-to-back, box and L-headers.		
23.05	Lay out and install a steel stud structural wall with openings to include bracing and blocking.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-MG.1.3	
23.06	Lay out and install a steel stud non-structural wall with openings to include blocking and bracing.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-MG.1.3	
24.0	Perform site-preparation and layout activities--The student will be able to:		
24.01	Identify building layout from plans and specifications using math skills.		
24.02	Set up and adjust a transit and builder's level over one point and establish lines over two points.	MAFS.912.N-Q.1.1,2,3 MAFS.912.A-REI.4.10	
24.03	Erect batter boards and locate building lines.		
24.04	Locate building line points on batter boards using a builder's level.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-SRT.3.8	
24.05	Locate building lines on a plot plan.		
24.06	Square a building, using the 3-4-5-triangle method and the diagonal method.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-SRT.2.4 MAFS.912.G-SRT.3.8	
25.0	Explain the importance of employability and entrepreneurship skills--The student will be able to:		
25.01	Identify and demonstrate positive work behaviors needed to be employable.		
25.02	Develop personal career plan that includes goals, objectives and strategies.		
25.03	Examine licensing, certification and industry credentialing requirements.	LAFS.1112.W.3.7	

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
25.04 Maintain a career portfolio to document knowledge, skills and experience.	LAFS.1112.W.3.7 LAFS.1112.RI.1.1	SC.912.N.1.1
25.05 Evaluate and compare employment opportunities that match career goals.		SC.912.N.1.1
25.06 Identify and exhibit traits for retaining employment.		
25.07 Identify opportunities and research requirements for career advancement.		SC.912.N.1.1
25.08 Research the benefits of ongoing professional development.	LAFS.1112.W.3.7	SC.912.N.1.1
25.09 Examine and describe entrepreneurship opportunities as a career planning option.	LAFS.1112.W.3.7	SC.912.N.1.1

Florida Department of Education  
Student Performance Standards

**Course Title:** Carpentry 5  
**Course Number:** 8722150  
**Course Credit:** 1

**Course Description:**

This course provides students with knowledge and skills pertaining to concrete, foundations, forms and tilt-up construction.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts

NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
26.0 Perform concrete tests--The student will be able to:		
26.01 Identify various types of cement and describe their uses.		SC.912.L.15.4
26.02 Identify types and sizes of concrete aggregates.		SC.912.N.1.1 SC.912.P.8.2 SC.912.P.10.4
26.03 Research types of concrete admixtures and describe their uses.	LAFS.1112.W.3.7	SC.912.N.1.1
26.04 Research special types of concrete and describe their uses.	LAFS.1112.W.3.7	
26.05 Calculate concrete volume requirements for rectangular, cylindrical, or other geometric structures using formulas, concrete tables and/or concrete calculators, as applicable.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-GMD.1.1,3	SC.912.P.8.2 SC.912.P.10.4
26.06 Identify concrete curing methods and materials.		SC.912.P.8.2
26.07 Identify concrete testing methods.		SC.912.P.8.2
26.08 Mix concrete using different aggregates and admixtures.		SC.912.P.8.2 SC.912.N.1.1
26.09 Conduct concrete slump test.		SC.912.P.8.2 SC.912.N.1.1
27.0 Lay foundations--The student will be able to:		

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
27.01 Establish elevations.		
27.02 Identify various types of footing and foundations.	MAFS.912.G-CO.1.4,5 MAFS.912.G-CO.2.6	SC.912.L.15.4
27.03 Select the appropriate footing for a foundation.		SC.912.N.1.1
27.04 Lay out and construct a selected footing and foundation using an established gridline.		SC.912.N.1.1
27.05 Install templates, keyways and embedments.	MAFS.912.G-CO.1.4,5 MAFS.912.G-CO.2.6	
27.06 Form and strip pier foundation forms and prepare for resetting at another location.		
27.07 Identify the different classes of slabs-on-grade.		SC.912.L.15.4
27.08 Identify edge forms and explain their purpose.		SC.912.L.15.4
27.09 Construct and disassemble edge forms.		
27.10 Install vapor barrier, reinforcement and control joints.	MAFS.912.G-C.2.5	
27.11 Establish finish grade and fill requirements.		
<b>28.0 Construct vertical formwork--The student will be able to:</b>		
28.01 Explain safety procedures associated with using concrete wall forms.	LAFS.1112.SL.2.4	SC.912.L.15.4
28.02 Identify the various types of concrete wall forms.		
28.03 Identify the components of each type of vertical forming system.		
28.04 Erect, plumb and brace a selected wall.		
28.05 Recognize various types of manufactured forms.		
28.06 State the differences in construction and use among different types of forms.	LAFS.1112.SL.2.4	
28.07 Erect, plumb and brace a column form.		
28.08 Erect, plumb and brace a stair form.		SC.912.N.1.1
28.09 Locate and install bulkheads and embedded forms.		

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
29.0 Construct horizontal formwork--The student will be able to:		
29.01 Identify the safety hazards associated with elevated deck formwork and explain how to eliminate them.		SC.912.L.15.4
29.02 Identify the different types of elevated decks.		SC.912.L.15.4
29.03 Identify the different types of flying form systems.		SC.912.L.15.4
29.04 Identify different types of handset form systems.		
29.05 Erect, plumb, brace and level different types of handset deck form systems.		
29.06 Distinguish characteristics of joints: control, expansion and construction.		
29.07 Install edge forms, blockouts, embedments and construction joints.		SC.912.L.15.4
29.08 Identify typical bridge and culvert form systems.		
30.0 Erect and properly align tilt-up wall panels--The student will be able to:		
30.01 Describe the different processes used in installing tilt-up wall panels.	LAFS.1112.SL.2.4	SC.912.N.1.1
30.02 Explain the importance of the casting bed.	LAFS.1112.SL.2.4	SC.912.N.1.1
30.03 Identify and install the various types of lifting eyes used in forming tilt-up panels.		SC.912.N.1.1
30.04 Identify the special rigging requirements for tilt-up wall panels.		SC.912.N.1.1
30.05 Identify the different methods of forming tilt-up wall panels.		SC.912.N.1.1
30.06 Demonstrate the different methods of forming tilt-up wall panels.		SC.912.N.1.1
30.07 Prepare for the erection of tilt-up wall panels.		SC.912.N.1.1
30.08 Install proper bracing for tilt-up wall panels.		SC.912.N.1.1
30.09 Install embedments, blockouts, architectural finishes, lifting devices and reinforcing materials using a set of construction drawings.		SC.912.N.1.1
30.10 Describe the final grouting procedure.	LAFS.1112.SL.2.4	SC.912.L.15.4

Florida Department of Education  
Student Performance Standards

**Course Title:** Carpentry 6  
**Course Number:** 8722160  
**Course Credit:** 1

**Course Description:**

This course provides students interior and exterior finish carpentry skills. The content deals with the installation of drywall, doors and hardware, windows, trim, exterior stairs and exterior finishes.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
31.0 Install drywall --The student will be able to:		
31.01 Identify the different types of drywall and their uses.		SC.912.L.15.4
31.02 Select the type and thickness of drywall required for specific installations.		SC.912.N.1.1
31.03 Select fasteners for drywall installation.		
31.04 Explain the fastener schedules for different types of drywall installations.	LAFS.1112.SL.2.4	
31.05 Perform single-layer and multi-layer drywall installations using different types of fastening systems including nails, drywall screws and adhesives.		
31.06 Install gypsum drywall on steel studs.		
31.07 Explain how soundproofing is achieved in drywall installations.	LAFS.1112.SL.2.4	SC.912.P.10.20
31.08 Estimate material quantities for a drywall installation.	MAFS.912.N-Q.1.1,2,3	
32.0 Install a suspended ceiling--The student will be able to:		
32.01 Establish a level line.		
32.02 Explain the common terms related to sound waves and acoustical ceiling materials.	LAFS.910.RI.2.4 LAFS.1112.RI.2.4	SC.912.P.10.20

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
32.03 Identify the different types of suspended ceilings.		SC.912.L.15.4
32.04 Interpret plans related to ceiling layout.		SC.912.N.1.1
32.05 Sketch the ceiling layout for a basic suspended ceiling.		
32.06 Perform a material takeoff for a suspended ceiling.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-MG.1.3 MAFS.912.G-GMD.2.4	
32.07 Install selected suspended ceilings.		
33.0 Interpret door and door hardware requirements based on plans and specifications--The student will be able to:		
33.01 Identify various types of door jambs and frames and demonstrate the installation procedures for placing selected door jambs and frames in different types of interior partitions.		SC.912.L.15.4
33.02 Identify different types of interior doors.		SC.912.L.15.4
33.03 Identify different types of interior door hardware and demonstrate the installation procedures for selected types.		SC.912.L.15.4
33.04 List and identify specific items included on a typical door schedule.	LAFS.1112.W.2.4	
33.05 Explain the procedure for placing and hanging a specified door.	LAFS.1112.SL.2.4	
34.0 Install windows and exterior doors--The student will be able to:		
34.01 Identify various types of fixed, sliding and swinging windows.		SC.912.L.15.4
34.02 Identify the parts of a window installation.		SC.912.L.15.4
34.03 State the requirements for a proper window installation.	LAFS.910.SL.2.4 LAFS.1112.SL.2.4	
34.04 Install a pre-hung window.		
34.05 Identify the common types of exterior doors and explain how they are constructed.		SC.912.L.15.4
34.06 Identify the parts of a door installation.		SC.912.L.15.4
34.07 Identify the types of thresholds used with exterior doors.		SC.912.L.15.4
34.08 Install a pre-hung exterior door.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
34.09 Identify the various types of locksets used on exterior doors and explain how they are installed.		SC.912.L.15.4
34.10 Install a lockset.		
35.0 Apply interior trim--The student will be able to:		
35.01 Identify the different types of standard moldings and describe their uses.		SC.912.L.15.4
35.02 Make square and miter cuts using a saw buck or power miter saw.		
35.03 Select and properly use fasteners to install trim.		
35.04 Install interior trim including door, window, base and ceiling trim.		
35.05 Estimate the quantities of different trim materials required for selected rooms.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-MG.1.3 MAFS.912.G-GMD.2.4	
36.0 Lay out and construct an exterior stair system--The student will be able to:		
36.01 Identify the types of exterior stair systems.		SC.912.L.15.4
36.02 Identify the parts of an exterior stair system.		SC.912.L.15.4
36.03 Calculate the number of treads and risers for an exterior stair system.	MAFS.912.N-Q.1.1,2,3 MAFS.912.S-ID.3.7 MAFS.912.G-SRT.3.8 MAFS.912.G-SRT.2.4	
36.04 Lay out, cut and assemble an exterior stair system.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-SRT.1.1	
37.0 Apply exterior finishing--The student will be able to:		
37.01 Describe the purpose of wall insulation and flashing.	LAFS.1112.SL.2.4	SC.912.P.10.20 SC.912.P.10.4
37.02 Install selected common cornices.		



<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
37.03 Demonstrate lap and panel siding estimating methods.		
37.04 Describe the types and applications of common wood siding.	LAFS.1112.SL.1.1	
37.05 Describe fiber-cement siding and its uses.	LAFS.1112.SL.1.1	
37.06 Describe the types and styles of vinyl and metal siding.	LAFS.1112.SL.1.1	
37.07 Describe the types and applications of stucco and masonry veneer finishes.	LAFS.1112.SL.1.1	
37.08 Describe the types and applications of special exterior finish systems.		
37.09 Install three types of siding commonly used in your area.		

Florida Department of Education  
Student Performance Standards

Course Title:       Carpentry 7  
Course Number:     8722170  
Course Credit:      1

**Course Description:**

This course provides students with knowledge of rigging, scaffolding, concrete and trenching and excavation.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
38.0 Set up and install basic rigging and scaffolding--The student will be able to:		
38.01 Identify and explain rigging equipment.	LAFS.1112.SL.2.4	SC.912.L.15.4
38.02 Inspect rigging equipment, following safety precautions.		SC.912.N.1.1
38.03 Estimate size, weight and center of gravity.		SC.912.N.1.1 SC.912.P.12.4
38.04 Tie knots.		SC.912.N.1.1
38.05 Identify and explain types of cranes.	LAFS.1112.SL.2.4	SC.912.L.15.4
38.06 Rig and move materials and equipment, following safety precautions.		
38.07 Set up and install scaffolds, following safety precautions.		
38.08 Inspect various types of ladders and scaffolds, following safety precautions.		SC.912.N.1.1
39.0 Erect, plumb and brace a simple concrete form with reinforcement--The student will be able to:		
39.01 Identify the properties of cement.		SC.912.P.8.2
39.02 Describe the composition of concrete.	LAFS.1112.SL.2.4	SC.912.P.8.2
39.03 Estimate volumes of concrete.	MAFS.912.N- Q.1.1,2,3	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
		MAFS.912.G-GMD.2.4 MAFS.912.G-MG.1.1,3 MAFS.912.G-GMD.1.3	
39.04	Identify types of concrete reinforcement materials and describe their uses.	LAFS.1112.SL.2.4	SC.912.L.15.4
39.05	Identify various types of footings and explain their uses.	LAFS.1112.SL.2.4	SC.912.L.15.4
39.06	Identify the parts of various types of forms.		SC.912.L.15.4
39.07	Explain the safety procedures associated with the construction and use of concrete forms.	LAFS.1112.SL.1.1	
40.0	Explain and demonstrate how to place reinforcing bars in walls, columns, beams, girders, joists and slabs--The student will be able to:		
40.01	Describe the applications of reinforcing bars, the uses of reinforced structural concrete and the basic processes involved in placing reinforcing bars.	LAFS.1112.SL.1.2	
40.02	Recognize and identify the bar bends standardized by the American Concrete Institution (ACI).		SC.912.L.15.4
40.03	Read and interpret bar lists and describe the information found on a bar list.	LAFS.1112.RI.1.3	
40.04	List the types of ties used in securing reinforcing bars.	LAFS.1112.W.2.4	
40.05	State the tolerances allowed in the fabrication of reinforcing bars.	LAFS.1112.SL.1.1	
40.06	Demonstrate the proper use of common ties for reinforcing bars.		
40.07	Describe methods by which reinforcing bars may be cut and bent in the field.	LAFS.1112.SL.1.1	
40.08	Use the tools and equipment needed for installing reinforcing bars.		
40.09	Safely use selected tools and equipment to cut, bend and install reinforcing materials.		SC.912.N.1.1
40.10	Explain the necessity of concrete cover in placing reinforcing bars.	LAFS.1112.SL.1.1	
40.11	Identify lapped splices.		
41.0	Explain the transport and placement of concrete--The student will be able to:		
41.01	List various types of equipment used to transport and place concrete.	LAFS.1112.W.2.4	
41.02	Describe the factors that contribute to the quality of concrete placement.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
41.03 Demonstrate the correct methods for placing and consolidating concrete into forms.	LAFS.1112.SL.1.1	
41.04 Use a screed to strike off and level concrete to the proper grade in a form.		
41.05 Use tools for placing, floating and finishing concrete.		SC.912.N.1.1
41.06 Determine when conditions permit the concrete finishing operation to start.		SC.912.P.8.2
41.07 Name the factors that affect the curing of concrete and describe the methods used to achieve proper curing.	LAFS.1112.SL.1.1	SC.912.P.8.2
41.08 Properly care for and safely use hand and power tools used when working with concrete.		SC.912.N.1.1
42.0 Demonstrate an understanding of trenching and excavation--The student will be able to:		
42.01 Identify the different types, bearing capacities and classifications of soils.		SC.912.L.15.4
42.02 Identify ways to increase soil density.		SC.912.N.1.1 SC.912.P.8.2
42.03 State the purpose of soil density (compaction) tests.	LAFS.1112.SL.1.1	
42.04 Explain the safety considerations for trenches and deep excavations.	LAFS.1112.SL.1.1	SC.912.E.6.2
42.05 Identify and describe groundwater mitigation methods.		SC.912.E.6.2
42.06 Identify and describe rock mitigation techniques.		SC.912.E.6.2

## **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.

### **Special Notes**

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the postsecondary program with the same Classification of Instructional Programs (CIP) number.

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

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

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
Standard Length	Semester
Teacher Certification	Refer to the <b>Course Structure</b> section.
CTSO	SkillsUSA

**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.

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 BLDG CONST @7 7G BLDG MAINT @7 7G DRAFTING @7 7G	Semester

## **Florida Standards for English Language Development (ELD)**

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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.

**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 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.

<b>CTE Standards and Benchmarks</b>	
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.

06.02 Use e-mail clients to send simple messages and files to other Internet users.

## CTE Standards and Benchmarks

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.

### **Special Notes**

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.

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

SkillsUSA is the intercultural 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
Standard Length	Semester
Teacher Certification	Refer to the <b>Course Structure</b> section.
CTSO	SkillsUSA

**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.

**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 BLDG CONST @7 7G BLDG MAINT @7 7G DRAFTING @7 7G	Semester

**Florida Standards for English Language Development (ELD)**

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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.

**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 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--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 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.

<b>CTE Standards and Benchmarks</b>	
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.

06.02 Use e-mail clients to send simple messages and files to other Internet users.

## CTE Standards and Benchmarks

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.

### **Special Notes**

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.

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career Planning**

The requirements of section 1003.4156 (1) (e), Florida Statutes, have been integrated into this course. The statute requires that students take a career and education planning course that must result in a completed personalized academic and career plan for the student; must emphasize the importance of entrepreneurship skills; must emphasize technology or the application of technology in career fields; and, beginning in the 2014-2015 academic year, must provide information from the Department of Economic Opportunity's economic security report as described in section 445.07, Florida Statutes.

### **Career and Technical Student Organization (CTSO)**

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

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

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

**Secondary – Middle School**

Program Number	8130300
CIP Number	148130300M
Grade Level	6-8
Standard Length	Semester
Teacher Certification	Refer to the <b>Course Structure</b> section.
CTSO	SkillsUSA

**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.

**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 BLDG CONST @7 7G BLDG MAINT @7 7G DRAFTING @7 7G	Semester

**Florida Standards for English Language Development (ELD)**

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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.

**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 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.

<b>CTE Standards and Benchmarks</b>	
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.



## CTE Standards and Benchmarks

03.05 Read and interpret specifications.

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.

13.02 Identify basic principles of the Domain Name System (DNS).

## CTE Standards and Benchmarks

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.

### **Special Notes**

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.

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

SkillsUSA is the intercultural 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, 30, 31
Standard Length	Multiple credits
Teacher Certification	Refer to the <b>Course Structure</b> section.
CTSO	SkillsUSA

**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 or occupational completion point 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	VO
---------	---	---	--------------------------------	---	----

*(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)*

## **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**

<b>CTE Standards and Benchmarks</b>	
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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

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, 30, 31
Standard Length	Multiple credits
Teacher Certification	Refer to the <b>Course Structure</b> section.
CTSO	SkillsUSA

**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 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**

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
8700400	Architecture and Construction Cooperative Education OJT	Any Certification appropriate to the students' chosen career field	Multiple Credits	2	VO

*(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)*

## **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

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

<b>Standards and Benchmarks</b>	
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.

The occupational standards and benchmarks outlined in this secondary course correlate to the standards and benchmarks of the postsecondary course with the same Classification of Instructional Programs (CIP) number.

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

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	0646041502
Grade Level	9-12, 30, 31
Standard Length	7 Credits
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9071 - Maintenance and Repair Workers

**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. 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 the first occupational completion point may either continue with the training program or terminate as an occupational completer. 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:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
A	8720310	Building Construction Technologies 1	AC HEAT MC @7 7G	1 Credit	49-9071	2	VO
	8720320	Building Construction Technologies 2	BLDG CONST @7 7G BLDG MAINT @7 7G	1 Credit	49-9071	2	VO
	8720310	Building Construction Technologies 3	CARPENTRY @7 7G DRAFTING @7 7G	1 Credit	49-9071	3	VO
B	8720310	Building Construction Technologies 4	ELECTRICAL @7 7G ENG 7G	1 Credit	49-9071	2	VO
	8720310	Building Construction Technologies 5	TEC CONSTR @7 7G TEC DRAFT 7G	1 Credit	49-9071	2	VO
	8720310	Building Construction Technologies 6	TROWEL TR 7G PLUMBIN @7 7G	1 Credit	49-9071	2	VO
	8720310	Building Construction Technologies 7	SHEETMETAL @7 7G WOODWORKIN @4	1 Credit	49-9071	2	VO

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

### Academic Alignment Tables

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth- Space Science	Environmental Science	Genetics	Integrated Science 1	Marine Science 1 Honors	Physical Science	Physics 1
8720310	4/87 5%	4/80 5%	24/83 29%	4/69 6%	22/67 33%	4/70 6%	4/69 6%	22/82 27%	4/66 6%	22/74 30%	4/72 6%
8720320	6/87 7%	11/80 14%	26/83 31%	10/69 14%	25/67 37%	4/70 6%	7/69 10%	30/82 37%	11/66 17%	33/74 45%	10/72 14%
8720330	7/87 8%	8/80 10%	6/83 7%	7/69 10%	4/67 6%	15/70 21%	8/69 12%	6/82 7%	13/66 20%	5/74 7%	7/72 10%
8720340	22/87 25%	24/80 30%	2/83 2%	22/69 32%	3/67 4%	20/70 29%	23/69 33%	3/82 4%	18/66 27%	24/74 33%	24/72 33%
8720350	2/87 2%	4/80 5%	2/83 2%	2/69 3%	3/67 4%	#	3/69 4%	3/82 4%	3/66 5%	3/74 4%	4/72 6%

8720360	1/87 1%	2/80 3%	#	2/69 3%	1/67 1%	1/70 1%	1/69 1%	1/82 1%	1/66 2%	2/74 3%	2/72 3%
8720370	3/87 3%	5/80 6%	2/83 2%	5/69 7%	4/67 6%	2/70 3%	4/69 6%	3/82 4%	5/66 8%	7/74 9%	10/72 14%

# Alignment attempted, but no correlation to academic course

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8720310	17/67 25%	9/75 12%	23/54 43%	8/46 17%	8/45 18%	#	#
8720320	18/67 27%	10/75 13%	19/54 35%	5/46 11%	5/45 11%	#	#
8720330	6/67 9%	9/75 12%	5/54 9%	#	#	7/45 16%	7/45 16%
8720340	11/67 16%	16/75 21%	12/54 22%	#	#	4/45 9%	4/45 9%
8720350	4/67 6%	2/75 3%	3/54 6%	#	#	3/45 7%	3/45 7%
8720360	#	1/75 1%	#	#	#	4/45 9%	4/45 9%
8720370	3/67 4%	2/75 3%	2/54 4%	#	#	6/45 13%	6/45 13%

# Alignment attempted, but no correlation to academic course

### **Florida Standards for Technical Subjects**

*Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education.*

**Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.**

### **Florida Standards for English Language Development (ELD)**

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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.

### **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 Demonstrate carpentry skills.
- 07.0 Read and interpret construction drawings.
- 08.0 Frame floor systems based on drawing and specification requirements.
- 09.0 Frame walls and ceilings based on drawing and specification requirements.
- 10.0 Frame a roof based on drawing and specification requirements.
- 11.0 Analyze construction components, materials, hardware and characteristics.
- 12.0 Demonstrate masonry skills.
- 13.0 Erect, plumb and brace a simple concrete form with reinforcement.
- 14.0 Place concrete.
- 15.0 Lay masonry units.
- 16.0 Demonstrate science knowledge and skills.
- 17.0 Understand construction documents, contract documents and specifications.
- 18.0 Select the appropriate heavy equipment for a given task. (Optional)
- 19.0 Identify local, state and federal codes and regulations.
- 20.0 Perform site preparation and maintenance.
- 21.0 Estimate project costs and schedule construction activities for a specific job.
- 22.0 Explain all that the built environment encompasses.
- 23.0 Investigate sustainability issues related to the design, construction and maintenance of the built environment.
- 24.0 Complete a construction project using skills learned in the program
- 25.0 Install roofing materials.
- 26.0 Install exterior finishes.
- 27.0 Explain the importance of employability and entrepreneurship skills.
- 28.0 Demonstrate interior carpentry skill.
- 29.0 Install cabinets.
- 30.0 Prepare and apply finishes to surfaces.
- 31.0 Build stairs.
- 32.0 Troubleshoot, repair and install plumbing systems.
- 33.0 Demonstrate knowledge of drain, waste and vent (DWV) systems.
- 34.0 Measure, cut and join plastic piping.
- 35.0 Properly measure, ream, cut and join copper piping.
- 36.0 Troubleshoot, repair and install electrical systems.

- 37.0 Demonstrate electrical safety.
- 38.0 Research the heating, ventilation and air-conditioning (HVAC) profession.
- 39.0 Maintain, repair and install heating, ventilation and air-conditioning (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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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	Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200)	LAFS.910.W.2.4 LAFS.910.SL.2.4	
01.04	Identify and use safety equipment and personal protective equipment (PPE).	LAFS.910.RI.1.2,3	
01.05	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.	LAFS.910.W.2.4 LAFS.910.SL.2.4	
01.06	Explain emergency procedures to follow in response to workplace accidents.	LAFS.910.W.2.4 LAFS.910.SL.2.4 LAFS.910.RI.1.3	
02.0	Investigate the construction industry and explore related occupations--The student will be able to:		SC.912.L.17.13, 20
02.01	Describe the development of construction technology, its impact on the built environment and the impact of growth on the construction industry.	LAFS.910.W.1.2 LAFS.910.W.2.1,4 LAFS.910.W.3.7 LAFS.910.SL.2.4	



CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
02.02 Describe the benefits of the construction industry on health and safety, communication, transportation and the economy.	LAFS.910.W.1.2 LAFS.910.W.2.1,4 LAFS.910.W.3.7 LAFS.910.SL.2.4	
02.03 Demonstrate an understanding of the relationship between construction and the environment.	LAFS.910.W.1.2 LAFS.910.W.2.1,4 LAFS.910.W.3.7 LAFS.910.SL.2.4	
02.04 Describe the role of trade unions in the construction industry.	LAFS.910.W.1.2 LAFS.910.W.2.1,4 LAFS.910.W.3.7 LAFS.910.SL.2.4	
02.05 Research apprenticeship opportunities.	LAFS.910.W.1.2 LAFS.910.W.2.1,4 LAFS.910.W.3.7 LAFS.910.SL.2.4	
02.06 Identify the different classifications of construction projects.		
02.07 Define the roles and responsibilities of the general contractor, specialty contractor, construction management and design build firms.	LAFS.910.W.1.2 LAFS.910.W.2.1,4 LAFS.910.SL.2.4	
02.08 Research construction trade occupations and the roles and responsibilities of each craft.	LAFS.910.W.1.2 LAFS.910.W.2.1,4 LAFS.910.W.3.7 LAFS.910.SL.2.4	
02.09 Research construction management occupations and the roles and responsibilities of each.	LAFS.910.W.1.2 LAFS.910.W.2.1,4 LAFS.910.W.3.7 LAFS.910.SL.2.4	
02.10 Identify design and engineering occupations and the roles and responsibilities of each.	LAFS.910.W.1.2 LAFS.910.W.2.1,4 LAFS.910.SL.2.4	
02.11 Explain the relationship between construction and the economy.	LAFS.910.W.1.2 LAFS.910.W.2.1,4 LAFS.910.W.3.7 LAFS.910.SL.2.4	
02.12 Describe the process of applying for building permits and variances.	LAFS.910.W.2.4 LAFS.910.SL.2.4 LAFS.910.RI.1.3	
02.13 Demonstrate an understanding of zoning requirements.	LAFS.910.W.1.2 LAFS.910.W.2.1,4 LAFS.910.W.3.7 LAFS.910.SL.2.4	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
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 Identify and use various types of drill bits.		
03.05 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, 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 miter saws, drill presses, grinders, electric routers and pneumatic nailers.		
04.02 Describe the proper operation of power tools and equipment.	LAFS.910.W.2.4 LAFS.910.SL.2.4 LAFS.910.RI.1.3	
05.0 Demonstrate mathematics knowledge and skills relevant to the construction industry--The student will be able to:		SC.912.N.1.1
05.01 Solve job-related problems by adding, subtracting, multiplying and dividing numbers, using fractions, decimals and whole numbers.	MAFS.912.N-Q.1.1,2,3	
05.02 Change numbers to percentages.	MAFS.912.N-Q.1.1,2,3	
05.03 Demonstrate knowledge of arithmetic operations.	MAFS.912.N-Q.1.1,2,3	
05.04 Read a ruler and a tape measure.	MAFS.912.N-Q.1.1,2,3	
05.05 Compute feet, inches and yards.	MAFS.912.N-Q.1.1,2,3	
05.06 Change hours and minutes to decimals, fractions and mixed numbers.	MAFS.912.N-Q.1.1,2,3	
05.07 Analyze and apply data and measurements to solve problems and interpret documents.	MAFS.912.N-Q.1.1,2,3 LAFS.910.RI.1.1	
05.08 Determine ratios and proportions.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-SRT.3.6	
05.09 Convert decimals to fractions and fractions to decimals.	MAFS.912.N-Q.1.1,2,3	
05.10 Solve problems for volume, weight, area, circumference and perimeter measurements	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
for rectangles, squares and cylinders.	GMD.1.1,3 MAFS.912.G-MG.1.1	
06.0 Demonstrate carpentry skills--The student will be able to:		
06.01 Construct various types of concrete forms.		
06.02 Describe in-beds used in concrete formwork.	LAFS.910.W.2.4 LAFS.910.SL.2.4 LAFS.910.RI.1.3	
06.03 Identify appropriate form stripping and handling techniques.		
06.04 Lay out and install framing members for a structure.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-GPE.2.6 MAFS.912.G-MG.1.3	
06.05 Dry in a structure.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-MG.1.3	
07.0 Read and interpret construction drawings--The student will be able to:		
07.01 Identify basic construction drawing terms, components and symbols.		
07.02 Locate sections, elevations and details to their location on the plan view.		
07.03 Use drawing dimensions to lay out a construction project,	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-SRT.1.1	
07.04 Read architectural scales.		
08.0 Frame floor systems based on drawing and specification requirements--The student will be able to:		
08.01 Identify floor and sill framing and support members.		
08.02 Name the methods used to fasten sills to the foundation.		
08.03 Understand how girder/beam and joist sizes are selected.		
08.04 Identify different types of floor joists.		
08.05 Identify different types of bridging.		
08.06 Identify different types of flooring materials.		
08.07 Explain the purposes of subflooring and underlayment.	LAFS.910.W.2.4 LAFS.910.SL.2.4 LAFS.910.RI.1.3	
08.08 Match selected fasteners used in floor framing to their correct uses.		

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
08.09 Estimate the amount of material needed to frame a floor assembly.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-MG.1.3	
08.10 Demonstrate the ability to:		
a. Lay out and construct a floor assembly	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-GPE.2.6 MAFS.912.G-MG.1.3	
b. Install bridging (wood cross bridging, solid wood bridging and steel cross bridging).	MAFS.912.N-Q.1.1,2,3	
c. Install joists for a cantilever floor.	MAFS.912.N-Q.1.1,2,3	
d. Install a subfloor using butt-joint plywood/OSB panels and structural particle board.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-GPE.2.6 MAFS.912.G-MG.1.3	
e. Install a single floor system using tongue-and-groove plywood/OSB panels.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-GPE.2.6 MAFS.912.G-MG.1.3	
09.0 Frame walls and ceilings based on drawing and specification requirements--The student will be able to:		
09.01 Identify the components of a wall and ceiling layout.		
09.02 Lay out a wood frame wall, including plates, corner posts, door and window openings, partition Ts, bracing and the use of fire stops where applicable.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-GPE.2.6 MAFS.912.G-MG.1.3	
09.03 Describe the correct procedure for assembling and erecting an exterior wall.	LAFS.910.W.2.4 LAFS.910.SL.2.4	
09.04 Identify the common materials and methods used for installing sheathing on walls.		
09.05 Lay out, assemble, erect and brace exterior walls for a frame building.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-GPE.2.6 MAFS.912.G-MG.1.3	
09.06 Describe wall framing techniques used in masonry construction.	LAFS.910.W.2.4 LAFS.910.SL.2.4 LAFS.910.RI.1.3	
09.07 Explain the use of metal studs in wall framing.	LAFS.910.W.2.4 LAFS.910.SL.2.4 LAFS.910.RI.1.3	
09.08 Demonstrate correct procedure for laying out ceiling joists.		
09.09 Cut and install ceiling joists on a wood frame building.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-GPE.2.6 MAFS.912.G-MG.1.3	
09.10 Estimate the materials required to frame walls and ceilings.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-GPE.2.6	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	MAFS.912.G-MG.1.3	
10.0 Frame a roof based on drawing and specification requirements--The student will be able to:		
10.01 Define the terms associated with roof framing.	LAFS.910.RI.2.4	
10.02 Identify the roof framing members used in gable and hip roofs.		
10.03 Calculate the length of a rafter using various methods.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-GPE.2.6 MAFS.912.G-MG.1.3	
10.04 Identify the various types of trusses used in roof framing.		
10.05 Use a rafter framing square, speed square and calculator in laying out a roof.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-GMD.1.1 MAFS.912.G-GMD.2.4 MAFS.912.G-CO.4.12	
10.06 Identify various types of sheathing used in roof construction.		
10.07 Frame a gable roof with vent openings.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-GPE.2.6 MAFS.912.G-MG.1.3	
10.08 Frame a roof opening.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-GPE.2.6 MAFS.912.G-MG.1.3	
10.09 Erect a gable roof using trusses.		
10.10 Estimate the materials used in framing and sheathing a roof.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-MG.1.3	

**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
11.0 Analyze construction components, materials, hardware and characteristics--The student will be able to:		
11.01 Identify the components of various kinds of structures including slabs and foundations, interior and exterior walls, roofs and flooring systems.		
11.02 Identify the types of wall sections.		
11.03 Identify the types and installation procedures of roof, wall and floor sheathing.		
11.04 Identify various roof supports.		
12.0 Demonstrate masonry skills--The student will be able to:		
12.01 Select the tools and equipment used for mixing mortar.		
12.02 Describe the factors that affect the consistency of mortar.	LAFS.910.W.2.4 LAFS.910.SL.2.4 LAFS.910.RI.1.3	
12.03 Identify the common ratios (M, N, S and O) of mortar mixtures.		
12.04 Use pointing tools and strike mortar joints.		
12.05 Repoint old work.		
12.06 Prepare a work area, protecting adjacent areas.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
12.07 Apply mortar.		
12.08 Use various methods of putting up the line.		
12.09 Explain the uses for various types of trowels.	LAFS.910.W.2.4 LAFS.910.SL.2.4 LAFS.910.RI.1.3	
12.10 Research various types of caulking and application.	LAFS.910.W.1.2 LAFS.910.W.2.4 LAFS.910.W.3.7 LAFS.910.SL.2.4	
12.11 Describe procedures for stucco application and repair.	LAFS.910.W.2.4 LAFS.910.SL.2.4 LAFS.910.RI.1.3	
12.12 Mix various types of stucco.		
12.13 Understand the various types of concrete, considering application and Pounds per Square Inch (PSI) strength.	MAFS.912.N- Q.1.1,2,3 MAFS.912.G-MG.1.2	
12.14 Identify and select concrete tools.		
12.15 Install and repair concrete.		
12.16 Identify, select, use and maintain tools, materials and equipment used in masonry.		
12.17 Use safe and proper procedures for cleaning equipment, materials, work areas and worker.		
13.0 Erect, plumb and brace a simple concrete form with reinforcement--The student will be able to:		
13.01 Identify the properties of cement.		
13.02 Describe the composition of concrete.	LAFS.910.W.2.4 LAFS.910.SL.2.4	
13.03 Perform volume estimates for concrete quantity requirements.	MAFS.912.N- Q.1.1,2,3 MAFS.912.G- GMD.1.1,3	
13.04 Identify types of concrete reinforcement materials and describe their uses.		
13.05 Identify various types of footings and explain their uses.		
13.06 Identify the parts of various types of forms.		
13.07 Explain the safety procedures associated with the construction and use of concrete	LAFS.910.W.2.4 LAFS.910.SL.2.4	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
forms.	LAFS.910.RI.1.3	
14.0 Place concrete--The student will be able to:		
14.01 Slump test concrete before placement.		
14.02 Identify equipment used to transport and place concrete.		
14.03 Research the factors that contribute to the quality of concrete placement.	LAFS.910.W.1.2 LAFS.910.W.2.1,4 LAFS.910.W.3.7 LAFS.910.SL.2.4	
14.04 Place and consolidate concrete into forms.		
14.05 Strike off and level concrete using a screed.		
14.06 Use tools to place, float and finish concrete.		
14.07 Determine when conditions permit the concrete finishing operation to start.		
14.08 Name the factors that affect the curing of concrete and describe the methods used to achieve proper curing.		
15.0 Lay masonry units--The student will be able to:		
15.01 Describe the most common types of masonry units.	LAFS.910.W.2.4 LAFS.910.SL.2.4	
15.02 Describe how to set up and plumb a wall.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-CO.2.6	
15.03 Describe the transformation pattern (i.e., Different brick pattern, floor tile, plywood on floor, vinyl siding, etc.)	MAFS.912.G-CO.2.6	
15.04 Lay a dry bond.		
15.05 Spread and furrow a bed joint and butter masonry units.	LAFS.910.W.2.4 LAFS.910.SL.2.4	
15.06 Describe the different types of masonry bonds.		
15.07 Cut brick and block accurately.		
16.0 Demonstrate science knowledge and skills--The student will be able to:		SC.912.N.1.1, 3, 4, 7; SC.912.L.18.12; SC.912.P.8.2; SC.912.P.10.13, 14, 15, 16, 17;



CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
		SC.912.P.12.3, 11
16.01 Explain molecular action as a result of temperature extremes, chemical reaction and moisture content.		
16.02 Discuss the role of creativity in constructing scientific questions, methods and explanations.		
16.03 Formulate scientifically investigable questions, construct investigations, collect and evaluate data and develop scientific recommendations based on findings.	MAFS.912.S-IC.2.6	
16.04 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.		
16.05 Explain pressure measurement in terms of PSI and inches of mercury.	MAFS.912.G-MG.1.2	
16.06 Explain and demonstrate the use of electrical-system testing devices.		

**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
17.0 Understand construction documents, contract documents and specifications--The student will be able to:		SC.912.N.1.1; SC.912.N.3.5
17.01 Explain the purpose and components of contract documents and specifications.	LAFS.1112.W.1.2 LAFS.1112.W.2.4 LAFS.1112.W.3.7 LAFS.1112.SL.2.4	
17.02 Read, interpret and apply plans, elevations, sections and details.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-SRT.1.1 MAFS.912.G-GPE.2.6 MAFS.912.S-ID.3.7	
17.03 Explain the relationships of the elements of contract documents.	LAFS.1112.W.1.2 LAFS.1112.W.2.4 LAFS.1112.W.3.7 LAFS.1112.SL.2.4	
17.04 Create lists of materials and prepare estimates.		
17.05 Use architectural and engineering scales.		
17.06 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)	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-CO.4.12 LAFS.1112.W.2.4	
17.07 Compare and analyze traditional drafting with computer-aided drafting (CAD) and	LAFS.1112.W.3.7,8	SC.912.L.17.11, 15

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
	building information modeling (BIM) to learn how technology has altered opportunities for innovative responses and results.		
17.08	Investigate the use of technology and other resources to inspire design decisions.	LAFS.1112.W.3.7,8	SC.912.L.17.11, 15
18.0	Select the appropriate heavy equipment for a given task (optional)--The student will be able to:		
18.01	Identify different types and uses of heavy equipment.		
18.02	Describe the operations of different types of heavy equipment.	LAFS.1112.W.2.4 LAFS.1112.SL.2.4	
19.0	Identify local, state and federal codes and regulations--The student will be able to:		
19.01	Identify and locate local, state and federal codes, regulations and standards.		
19.02	Identify local, state and federal regulatory agencies.		
20.0	Perform site preparation and maintenance--The student will be able to:		
20.01	Understand zoning requirements.		
20.02	Understand property lines and building setbacks.	MAFS.912.G-CO.4.12	
20.03	Determine elevations.	MAFS.912.G-CO.4.12	
20.04	Understand the need to add, remove or relocate fill to proper compaction.	MAFS.912.N-Q.1.1,2,3 MAFS.912.S-IC.2.6 MAFS.912.S-ID.3.7	
20.05	Lay out and mark building location and elevation.	MAFS.912.G-CO.4.12	
20.06	Clean and maintain the site.		
21.0	Estimate project costs and schedule construction activities for a specific job--The student will be able to:		
21.01	Calculate material quantities and purchase cost (including sales tax).	MAFS.912.N-Q.1.1,2,3	
21.02	Calculate labor costs including work hours, duration and cost of workers.	MAFS.912.N-Q.1.1,2,3	
21.03	Explain and compute federal, state and local taxes.	MAFS.912.N-Q.1.1,2,3	
21.04	Schedule various construction activities.		
21.05	Understand how construction project funds are allocated.	MAFS.912.N-Q.1.1,2,3	
22.0	Explain all that the built environment encompasses--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
22.01 Research the development of construction technology, its impact on the built environment and the impact of growth on the construction industry.	LAFS.1112.W.3.7,8,9	SC.912.N.1.1 SC.912.L.17.12,13 ,14,15,16,17,18
22.02 Describe and give examples of the influences and benefits of the construction industry on health and safety, communication, transportation and the economy.	LAFS.1112.SL.1.1 LAFS.1112.W.2.4	SC.912.N.1.1 SC.912.L.14.6 SC.912.L.17.12,13 ,14,15,16,17,18
22.03 Examine and compare the relationship between the built environment and the natural environment.	LAFS.1112.SL.1.1	SC.912.N.1.1 SC.912.L.17.12,13 ,14,15,16,17,18
22.04 Compare architectural designs and/or models to understand how technical and utilitarian components impact aesthetic qualities.	LAFS.1112.SL.1.1 LAFS.1112.RI.3.7	SC.912.N.1.1 SC.912.N.3.5
22.05 Analyze changes in architectural styles and construction practices over time relative to various environments.	LAFS.1112.SL.1.1 LAFS.1112.RI.3.7	SC.912.N.1.1
22.06 Describe the significance of major architects, engineers or inventors to understand their historical influences.	LAFS.1112.SL.1.1	SC.912.N.1.1 SC.912.N.2.5
22.07 Research innovative historical architectural and/or engineering works and examine the significance of their legacy for the future.	LAFS.1112.W.3.7,8,9	SC.912.N.1.1 SC.912.N.2.5
22.08 Identify transitions in design media, technique and focus to explain how technology has changed design throughout history.	LAFS.1112.RI.1.2	SC.912.N.1.1
23.0 Investigate sustainability issues related to the design, construction and maintenance of the built environment--The student will be able to:		SC.912.L.17.10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
23.01 Describe the impact of the construction industry on the natural environment.	LAFS.1112.W.1.2 LAFS.1112.W.2.4 LAFS.1112.W.3.7 LAFS.1112.SL.2.4	
23.02 Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.	LAFS.910.W.1.2 LAFS.910.W.2.1,4 LAFS.910.W.3.7 LAFS.910.SL.2.4 LAFS.1112.W.1.2 LAFS.1112.W.2.4 LAFS.1112.W.3.7 LAFS.1112.SL.2.4	
23.03 Recommend sustainable alternatives to conventional construction practices.	LAFS.1112.W.3.7,8	
23.04 Identify specific practices that can lessen adverse impacts on the environment.		
23.05 Understand holistic green construction.	LAFS.1112.W.3.7,8	
24.0 Complete a construction project using skills learned in the program—The student will be able to:		

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
24.01	Manipulate materials, techniques and processes through practice and perseverance using malleable and/ or rigid materials to create a 3-dimensional representational or abstract model.		
24.02	Use divergent thinking, abstract reasoning and various processes to demonstrate imaginative or innovative solutions for a project.		
24.03	Develop competence and dexterity through practice in the use of processes, tools and techniques.		
24.04	Solve design and construction problems, through convergent and divergent thinking, to gain new perspectives.		
24.05	Apply critical-thinking and problem solving skills used in design to develop solutions for real-life issues.		
24.06	Use critical thinking skills for various contexts to develop, refine and reflect on a design theme.		
24.07	Use and maintain tools and equipment to facilitate design and construction process.		
24.08	Work in a project team to show creative 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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
25.0 Install roofing materials--The student will be able to:		
25.01 Identify and explain different types of roofing systems and applications.		
25.02 Install various types of shingles.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-CO.2.6	
25.03 Install roof gutters and downspouts.		
25.04 Seal pipes and vents on roofs.		
25.05 Identify installation procedures for sheet metal roofs, built-up roofs and roof flashing.		
26.0 Install exterior finishes--The student will be able to:		SC.912.P.10.4
26.01 Describe the purpose of wall insulation and flashing.	LAFS.1112.W.2.4 LAFS.1112.SL.2.4	
26.02 Install common cornices.	MAFS.912.N-Q.1.1,2,3	
26.03 Estimate lap and panel siding.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-CO.2.6 MAFS.912.G-GMD.2.4 MAFS.912.G-MG1.1,3	
26.04 Describe the types and applications of various types of siding (e.g. wood, fiber-cement, vinyl, metal, stucco, masonry, etc.).	LAFS.1112.W.2.4 LAFS.1112.SL.2.4	
26.05 Install siding.	MAFS.912.N-Q.1.1,2,3	

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.	LAFS.1112.W.2.4 LAFS.1112.W.2.5	
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.	LAFS.1112.W.2.4	
27.06	Identify and exhibit traits for retaining employment.		
27.07	Identify opportunities and research requirements for career advancement.	LAFS.1112.W.3.7	
27.08	Research the benefits of ongoing professional development.	LAFS.1112.W.3.7	
27.09	Examine and describe entrepreneurship opportunities as a career planning option.	LAFS.1112.W.2.4 LAFS.1112.SL.2.4	

**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
28.0 Demonstrate interior carpentry skills--The student will be able to:		SC.912.P.10.4
28.01 Install interior finish materials.	MAFS.912.N-Q.1.1,2,3	
28.02 Install exterior and interior doors.	MAFS.912.N-Q.1.1,2,3	
29.0 Install cabinets--The student will be able to:		
29.01 Identify the parts of a cabinet.		
29.02 Identify the types of cabinet-door installation.		
29.03 Identify the types of cabinet hardware.		
29.04 Install cabinet hardware.	MAFS.912.N-Q.1.1,2,3	
29.05 Describe cabinet-installation procedures.	LAFS.1112.W.2.4 LAFS.1112.SL.2.4 LAFS.1112.RI.1.3	
30.0 Prepare and apply finishes to surfaces--The student will be able to:		
30.01 Erect an extension ladder and a scaffold.		
30.02 Prepare surfaces for finishes.		
30.03 Apply finished coatings to surfaces with a roller, brush and sprayer.		



CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
31.0 Build stairs--The student will be able to:		
31.01 Identify various types and parts of stairs.		
31.02 Identify materials used in the construction of stairs.		
31.03 Interpret construction drawings of stairs.		
31.04 Calculate the total rise, the number and size of the risers and treads required for a stairway.	MAFS.912.N-Q.1.1,2,3 MAFS.912.S-ID.3.7 MAFS.912.G-SRT.3.8 MAFS.912.G-SRT.2.4	
31.05 Lay out and cut stringers, risers and treads.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-SRT.1.1	

**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
32.0 Troubleshoot, repair and install plumbing systems--The student will be able to:		SC.912.P.10.4
32.01 Troubleshoot, repair and install bathroom fixtures and hardware such as lavatories, water closets, urinals, showers, bathtubs, traps and drain, waste and vent (DWV) systems.		
32.02 Troubleshoot, repair and install kitchen fixtures and hardware, such as sinks, garbage disposals, faucets and hot-water-heater tanks.		
32.03 Identify and install various pipes and tubing used in the plumbing trade.		
32.04 Test and inspect plumbing systems.		
33.0 Demonstrate knowledge of drain, waste and vent (DWV) systems-- The student will be able to:		SC.912.P.12.10
33.01 Explain how waste moves from a fixture through the drain system to the environment.	LAFS.1112.W.2.4 LAFS.1112.SL.2.4 LAFS.1112.RI.1.3	
33.02 Identify the major components of a drainage system and describe their functions.		
33.03 Identify the different types of traps and their components, explain the importance of traps and identify the ways that traps can lose their seals.	LAFS.1112.W.2.4 LAFS.1112.SL.2.4 LAFS.1112.RI.1.3	
33.04 Identify the various types of drain, waste and vent (DWV) fittings and describe their applications.		
33.05 Identify significant code and health issues, violations and consequences related to DWV systems.		

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
34.0 Measure, cut and join plastic piping--The student will be able to:		
34.01 Research types of materials and schedules of plastic piping.	LAFS.1112.W.3.7	
34.02 Identify proper and improper applications of plastic piping.		
34.03 Research types of fittings and valves used with plastic piping.	LAFS.1112.W.3.7	
34.04 Identify and determine the kinds of hangers and supports needed for plastic piping.		
34.05 Apply the various techniques used in hanging and supporting plastic piping.		
34.06 Explain proper procedures for the handling, storage and protection of plastic pipes.	LAFS.1112.W.2.4 LAFS.1112.SL.2.4 LAFS.1112.RI.1.3	
35.0 Properly measure, ream, cut and join copper piping--The student will be able to:		
35.01 Research the types of materials and schedules used with copper piping.	LAFS.1112.W.3.7	
35.02 Identify the material properties, storage and handling requirements of copper piping.		
35.03 Research the types of fittings and valves used with copper piping.	LAFS.1112.W.3.7	
35.04 Apply the techniques used in hanging and supporting copper piping.		
35.05 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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
36.0 Troubleshoot, repair and install electrical systems--The student will be able to:	LAFS.1112.W.2.4 LAFS.1112.SL.2.4 LAFS.1112.RI.1.3	SC.912.P.10.13, 14, 15, 16, 17
36.01 Explain basic electrical theory.	LAFS.1112.W.2.4 LAFS.1112.SL.2.4 LAFS.1112.RI.1.3	
36.02 Explain branch circuit systems.		
36.03 Calculate and select service-entrance equipment.		
36.04 Identify and explain Ground Fault Circuit Interrupter (GFCI) circuitry.		
36.05 Troubleshoot electrical systems, using testing and metering devices.		
36.06 Install electrical outlets, switches and light fixtures.		
36.07 Install and replace breakers and fuses.		
36.08 Identify types of wiring raceways.		
36.09 Wire a blower motor into an electrical supply.		
36.10 Test and inspect electrical systems.	LAFS.1112.W.2.4 LAFS.1112.SL.2.4 LAFS.1112.RI.1.3	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
36.11 Explain basic motor-control operation.	LAFS.1112.W.2.4 LAFS.1112.SL.2.4	
36.12 Describe rules for installing electric space heating and HVAC requirements.		
37.0 Demonstrate electrical safety--The student will be able to:		
37.01 Identify electrical hazards and how to avoid or minimize them in the workplace.	LAFS.1112.W.2.4 LAFS.1112.SL.2.4 LAFS.1112.RI.1.3	
37.02 Explain safety issues concerning lockout/tag-out procedures, confined space entry, respiratory protection and fall protection systems.		
37.03 Develop a task plan and hazard assessment for a given task and select the appropriate personal protective equipment (PPE) and work methods.	LAFS.1112.W.2.4 LAFS.1112.SL.2.4	
37.04 Explain the Role of the National Electric Code and describe how to determine electric service requirements.		
38.0 Research the heating, ventilation and air-conditioning (HVAC) profession--The student will be able to:	LAFS.1112.W.3.7,8	
38.01 Research careers in the HVAC industry and the educational pathways (including apprenticeships) available.	LAFS.1112.W.2.4 LAFS.1112.SL.2.4 LAFS.1112.RI.1.3	
38.02 Explain what the 'Clean Air Act' means to the HVAC profession.	LAFS.1112.W.2.4 LAFS.1112.SL.2.4	
38.03 Describe regulatory codes relevant to the HVAC industry.		
39.0 Maintain, repair and install heating, ventilation and air-conditioning (HVAC) systems--The student will be able to:	LAFS.1112.RI.1.1	SC.912.P.10.2, 4, 5; SC.912.P.12.10
39.01 Read and interpret HVAC plans and schedules.		
39.02 Explain heating and cooling principles and code requirements.		
39.03 Calculate heating and cooling loads using various methods.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-MG.1.2,3 LAFS.1112.W.2.4 LAFS.1112.SL.2.4 LAFS.1112.RI.1.3	
39.04 Explain the operation and types of the following heating methods: water, steam, forced air, gas, electrical components and heat pumps.		
39.05 Troubleshoot and repair a circulation pump, zone valves, burners, pilot lights and thermocouples in a heating system.		
39.06 Identify refrigerants.		

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
39.07 Determine a refrigerant level.	LAFS.1112.W.2.4 LAFS.1112.SL.2.4	
39.08 Describe the proper procedures for descaling air-conditioner units.		
39.09 Troubleshoot, repair and replace air filters, drive belts and drain systems.		
39.10 Troubleshoot, repair and replace control systems.	LAFS.1112.W.3.7,8	
39.11 Research computer monitoring systems associated with heating, ventilation and air-conditioning (HVAC) control systems and air-quality management.	LAFS.1112.W.2.4 LAFS.1112.SL.2.4 LAFS.1112.RI.1.3	

## **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.

### **Special Notes**

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the postsecondary program with the same Classification of Instructional Programs (CIP) number.

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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



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, 30, 31
Standard Length	4 Credits
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-2141 - Painters, Construction and Maintenance

**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 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 secondary program structure:

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

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

### Academic Alignment Tables

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8721510	**	**	**	**	**	**	**	**	**	**	**
8721520	**	**	**	**	**	**	**	**	**	**	**
8721530	**	**	**	**	**	**	**	**	**	**	**
8721540	**	**	**	**	**	**	**	**	**	**	**

\*\* Alignment pending review

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8721510	**	**	**	**	**	**	**
8721520	**	**	**	**	**	**	**
8721530	**	**	**	**	**	**	**
8721540	**	**	**	**	**	**	**

\*\* Alignment pending review

### Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and

*language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education.*

**Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.**

**Florida Standards for English Language Development (ELD)**

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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.

## **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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
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.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
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.		
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.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
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.		
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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		
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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		
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.

### **Special Notes**

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the postsecondary program with the same Classification of Instructional Programs (CIP) number.

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

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



Florida Department of Education  
Curriculum Framework

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

**Secondary – Career Preparatory**

Program Number	8721600
CIP Number	0646050302
Grade Level	9-12, 30, 31
Standard Length	7 Credits
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-3015 - Helpers—Pipelayers, Plumbers, Pipefitters, and Steamfitters 47-2152 - Plumbers, Pipefitters, and Steamfitters

**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.

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:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
A	8721610	Plumbing Technology 1	PLUMBIN @7 7G BLDG CONST ¶¶ 7 ¶¶ G TEC CONSTR ¶¶ 7 ¶¶ G	1 Credit	47-3015	2	VO
	8721620	Plumbing Technology 2		1 Credit	47-3015	2	VO
B	8721630	Plumbing Technology 3		1 Credit	47-2152	2	VO
	8721640	Plumbing Technology 4		1 Credit	47-2152	2	VO
C	8721650	Plumbing Technology 5		1 Credit	47-2152	2	VO
	8721660	Plumbing Technology 6		1 Credit	47-2152	2	VO
D	8721670	Plumbing Technology 7		1 Credit	47-2152	2	VO

*(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)*

## Academic Alignment Tables

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8721610	**	**	**	**	**	**	**	**	**	**	**
8721620	**	**	**	**	**	**	**	**	**	**	**
8721630	**	**	**	**	**	**	**	**	**	**	**
8721640	**	**	**	**	**	**	**	**	**	**	**
8721650	**	**	**	**	**	**	**	**	**	**	**

8721660	**	**	**	**	**	**	**	**	**	**	**
8721670	**	**	**	**	**	**	**	**	**	**	**

\*\* Alignment pending review

# Alignment attempted, but no correlation to academic course

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8721610	**	**	**	**	**	**	**
8721620	**	**	**	**	**	**	**
8721630	**	**	**	**	**	**	**
8721640	**	**	**	**	**	**	**
8721650	**	**	**	**	**	**	**
8721660	**	**	**	**	**	**	**
8721670	**	**	**	**	**	**	**

\*\* Alignment pending review

# Alignment attempted, but no correlation to academic course

### **Florida Standards for Technical Subjects**

*Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education.*

**Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.**

### **Florida Standards for English Language Development (ELD)**

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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.

## **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 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 mathematics knowledge and skills.
- 06.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
- 07.0 Read and interpret construction documents.
- 08.0 Read and interpret basic pipe-trade codes.
- 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 Lay out and coordinate a job.
- 14.0 Install first rough (underground).
- 15.0 Install second rough (first floor and above).
- 16.0 Trim out plumbing.
- 17.0 Explain the importance of employability and entrepreneurship skills.
- 18.0 Install hot-water-heating and circulating-systems.
- 19.0 Install interceptors and separators.
- 20.0 Install a storm drainage system.
- 21.0 Explain the principles of backflow cross and connection control.
- 22.0 Explain the process of installing a medical gas system. (optional)
- 23.0 Explain how Liquid Propane Gas (LPG) system works.
- 24.0 Repair, service and maintain plumbing systems.
- 25.0 Explain how to connect residential plumbing to a municipal sewer line. (optional)

**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
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.		
04.07 Demonstrate an understanding of when and how to use first aid.		
05.0 Demonstrate 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.		
05.02 Measure tolerances on horizontal and vertical surfaces, using millimeters, centimeters, feet and inches.		
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 offset and metric conversion.		
05.05 Calculate material length and bend pipe by hand or with a pipe-bending machine and tools.		
05.06 Construct charts/tables/graphs using functions and data.		

**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
06.0	Demonstrate science knowledge and skills --The student will be able to:		
06.01	Describe molecular action as a result of temperature and pressure extremes, chemical reaction and moisture content.		
06.02	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.		
06.03	Discuss environmental concerns related to hazardous waste and chemical disposal.		
06.04	Explain pressure measurement in terms of Pounds per Square Inch (PSI), inches of mercury and KPA.		
06.05	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.		
07.03	Identify the basic symbols used in the pipe trades.		



<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
07.04 Read and interpret manufacturers' schematics and specifications.		
08.0 Read and interpret basic 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.		
08.03 Read and interpret basic building codes in the pipe-trade industry.		

**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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:		
a. Pipe and fitting		
b. Pipe-joining methods		
c. Plumbing fixtures, appliances, materials and equipment		
d. 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, clamping, compression, threading, flange, flaring, gasket joint, gluing, soldering and welding.		
10.02 Measure, mark and cut different types of pipes using various pipe cutters including one- and four-wheel steel pipe cutters, hack saw, tubing cutter and cutting torch.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
10.03 Thread a steel pipe 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 applicable plumbing codes.		
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 Lay out 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.		

**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 lay out and coordinate a job install the first, second rough and trim out plumbing

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
14.0	Install the first rough (underground)--The student will be able to:		
14.01	Lay out a job on site underground and establish a starting point according to codes and specifications, coordinating with other crafts.		
14.02	Install building drain, waste, vent, storm drainage and water-heating-and-circulating systems.		
14.03	Install distribution systems.		
14.04	Install a temporary water service with backflow prevention.		
14.05	Test and inspect the first rough.		
15.0	Install the second rough (first floor and above)--The student will be able to:		
15.01	Lay out a job on site for the first floor and above according to codes and specifications, coordinating with other crafts.		
15.02	Cut openings in walls and floors to accommodate the pipe and fittings.		
15.03	Install hangers and supports.		
15.04	Install building-drain, waste vent, storm-drainage and water-heating-and-circulating systems (including hot-tubs and spas).		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
15.05 Install distribution systems.		
15.06 Test and inspect the second rough.		
16.0 Trim out plumbing--The student will be able to:		
16.01 Distribute and place fixtures, appliances and equipment including safety devices and control.		
16.02 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 Install backflow assemblies as required.		
16.04 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.		

**Florida Department of Education  
Student Performance Standards**

**Course Title:** Plumbing Technology 5  
**Course Number:** 8721650  
**Course Credit:** 1

**Course Description:**

This course is designed to provide students with competencies relating to installing hot water heating, interceptors and separators.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
18.0 Install hot-water-heating and circulating systems --The student will be able to:		
18.01 Explain the basic theory of domestic hot-water-heating.		
18.02 Design, size and lay out a system.		
18.03 Identify the equipment and materials needed for the job in accordance with job specifications and plumbing codes.		
18.04 Test and inspect the system.		
19.0 Install interceptors and separators--The student will be able to:		
19.01 Identify and explain various types of interceptors and separators.		
19.02 Explain the theory and function of various interceptors and separators.		
19.03 Install and maintain lint and grease traps, gas and oil separators, sand and sediment interceptors.		

**Florida Department of Education  
Student Performance Standards**

**Course Title:** Plumbing Technology 6  
**Course Number:** 8721660  
**Course Credit:** 1

**Course Description:**

This course is designed to provide students with competencies in installing storm drainage, backflow and cross connection control.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
20.0 Install 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 lay out a storm-drainage system.		
20.03 Identify and select the materials needed to install a storm-drainage system in accordance with job specifications and plumbing codes.		
20.04 Lay out a job on site according to job specifications and plumbing codes, coordinating with other trades.		
20.05 Install distribution systems.		
20.06 Illustrate roof drains, leaders and drainage systems.		
20.07 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.		

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSS-Sci</b>
21.04 Explain the "degree of hazard" principle and how it relates to the installation of devices and assemblies.		



**Florida Department of Education  
Student Performance Standards**

**Course Title:** Plumbing Technology 7  
**Course Number:** 8721670  
**Course Credit:** 1

**Course Description:**

This course is designed to provide students with more in-depth study of trimming out plumbing and developing positive customer-relations skills.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
22.0 Explain the process of installing a medical gas system (optional)--The student will be able to:		
22.01 Explain procedures for:		
a. Installing a medical gas system in a health-care facility according to applicable plumbing codes		
b. Connecting medical equipment, safety devices and controls		
c. Testing and inspecting medical gas systems to make sure there is no cross connection and the system is pure		
23.0 Explain how a Liquid Propane Gas (LPG) system works--The student will be able to:		
23.01 Identify materials required for LPG installation.		
23.02 Explain how to size and lay out a job on site according to plumbing codes and specifications codes.		
23.03 Explain distribution systems, including equipment, safety devices and controls.		
23.04 Explain how to inspect the systems.		
24.0 Repair, service and maintain plumbing systems--The student will be able to:		
24.01 Troubleshoot and diagnose plumbing systems.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
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 line (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 house drain to a sewer main.		
25.03 Connect the house drain to the sewer main.		
25.04 Test and inspect the system.		

## **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.

### **Special Notes**

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the postsecondary program with the same Classification of Instructional Programs (CIP) number.

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

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

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	0646041506
Grade Level	9-12, 30, 31
Standard Length	6 Credits
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9071 - Maintenance and Repair Workers, General

**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. 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 each occupational completion point may either continue with the training program or terminate as an occupational completer.

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:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
A	8722010	Building Trades and Construction Design Technology 1	AC HEAT MC @7 7G BLDG CONST @7 7G	1 Credit	49-9071	2	VO
	8722020	Building Trades and Construction Design Technology 2	BLDG MAINT @7 7G CARPENTRY @7 7G	1 Credit	49-9071	2	VO
	8722030	Building Trades and Construction Design Technology 3	DRAFTING @7 7G ELECTRICAL @7 7G	1 Credit	49-9071	3	PA
B	8722040	Building Trades and Construction Design Technology 4	ENG 7G TEC CONSTR @7 7G TEC DRAFT 7G	1 Credit	49-9071	2	VO
C	8722050	Building Trades and Construction Design Technology 5	TECH ED 1@2 PLUMBIN @7 7G ROOFING 7G	1 Credit	49-9071	2	VO
D	8722060	Building Trades and Construction Design Technology 6	SHEETMETAL @7 7G TROWEL TR 7G WOODWORKIN @4	1 Credit	49-9071	3	PA

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

### **Academic Alignment Tables**

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science 1	Marine Science 1 Honors	Physical Science	Physics 1
8722010	1/87 1%	2/80 3%	26/83 31%	1/69 1%	25/67 37%	4/70 6%	2/69 3%	24/82 29%	6/66 9%	24/74 32%	2/72 3%

8722020	3/87 3%	6/80 8%	25/83 30%	6/69 9%	24/67 36%	5/70 7%	4/69 6%	25/82 30%	8/66 12%	26/74 35%	8/72 11%
8722030	28/87 32%	38/80 48%	11/83 13%	36/69 52%	9/67 13%	47/70 67%	32/69 46%	11/82 13%	43/66 65%	14/74 19%	38/72 53%
8722040	21/87 24%	23/80 29%	4/83 5%	22/69 32%	2/67 3%	30/70 43%	23/69 33%	1/82 1%	20/66 30%	3/74 4%	22/72 31%
8722050	4/87 5%	8/80 10%	4/83 5%	7/69 10%	8/67 12%	3/70 4%	4/69 6%	8/82 10%	4/66 6%	12/74 16%	11/72 15%
8722060	#	#	#	#	#	#	#	#	#	#	#

# Alignment attempted, but no correlation to academic course

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8722010	19/67 28%	9/75 12%	21/54 39%	18/46 39%	18/45 40%	#	#
8722020	18/67 27%	10/75 13%	25/54 46%	6/46 13%	6/45 13%	#	#
8722030	14/67 21%	20/75 27%	14/54 26%	#	#	11/45 24%	11/45 24%
8722040	11/67 16%	16/75 21%	9/54 17%	#	#	11/45 24%	11/45 24%
8722050	4/67 6%	7/75 9%	3/54 6%	#	#	11/45 24%	11/45 24%
8722060	#	#	#	#	#	#	#

# Alignment attempted, but no correlation to academic course

### **Florida Standards for Technical Subjects**

*Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education.*

**Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.**

### **Florida Standards for English Language Development (ELD)**

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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.



## **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 Research, 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 rough and finish carpentry skills.
- 08.0 Demonstrate masonry skills.
- 09.0 Demonstrate painting and decorating skills.
- 10.0 Demonstrate 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 and how they apply to the construction process.
- 16.0 Demonstrate electrical rough in skills.
- 17.0 Demonstrate finish electrical skills.
- 18.0 Demonstrate plumbing rough in skills.
- 19.0 Demonstrate finish plumbing skills.
- 20.0 Demonstrate heating, ventilation and air conditioning (HVAC) rough in skills.
- 21.0 Demonstrate finish heating, ventilation and air conditioning (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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.	LAFS.910.RI.3.9 LAFS.910.RI.4.10	SC.912.N.1.1 SC.912.L.14.6 SC.912.L.17.13
01.02 Be able to demonstrate the purpose of Safety Data Sheets (formerly known as Material Safety Data Sheets (MSDS)) and follow the procedures as necessary.	LAFS.910.RI.3.9 LAFS.910.RI.4.10	SC.912.N.1.1 SC.912.L.14.6 SC.912.L.17.13
01.03 Discuss, analyze and explain the “Right-to-Know” Law as recorded in (29 CFR-1910.1200).	LAFS.910.RI.3.9 LAFS.910.RI.4.10	SC.912.N.1.1 SC.912.L.14.6 SC.912.L.17.13
01.04 Identify and demonstrate the use of safety equipment such as fall arrest systems, fire extinguishers, scaffolds and ladders.	MAFS.912.F-IF.2.6 MAFS.912.S-ID.3.7 LAFS.910.SL.1.1	SC.912.N.1.1
01.05 Identify, interpret and follow disaster plans.	LAFS.910.RI.3.9 LAFS.910.RI.4.10	SC.912.N.1.1 SC.912.E.7.6
01.06 Describe and demonstrate appropriate safety attitudes and behaviors in the shop and on the job in the construction industry.	LAFS.910.SL.2.4	SC.912.N.1.1
01.07 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.	LAFS.910.SL.1.1 LAFS.910.SL.2.4	SC.912.N.1.1
01.08 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.	LAFS.910.SL.1.1	SC.912.N.1.1 SC.912.L.14.6 SC.912.L.17.13

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSS-Sci</b>
01.09	Explain and demonstrate emergency procedures to follow in response to workplace accidents.	LAFS.910.SL.1.1	SC.912.N.1.1
01.10	Create a disaster and/or emergency response plan for a specific instance.	LAFS.910.W.2.4,5 LAFS.910.W.1.2	SC.912.N.1.1 SC.912.E.7.6
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.		SC.912.N.1.1
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.		SC.912.N.1.1
04.0	Research, identify, classify and present construction components, materials, hardware and characteristics--The student will be able to:		
04.01	Research, identify and present the various components, materials and hardware used in residential construction applications.	MAFS.912.G-CO.4.12 MAFS.912.G-MG.1.1,2,3 LAFS.910.W.3.7,8,9 LAFS.910.SL.2.4,5,6	SC.912.N.1.1 SC.912.L.14.6 SC.912.L.17.13, 16, 17
04.02	Research, identify and present the various components, materials and hardware used in commercial construction applications.	MAFS.912.G-CO.4.12 MAFS.912.G-MG.1.1,2,3 LAFS.910.W.3.7,8,9 LAFS.910.SL.2.4,5,6	SC.912.N.1.1 SC.912.L.14.6 SC.912.L.17.13, 16, 17
04.03	Research, identify and present the various components, materials and hardware used in industrial construction applications.	MAFS.912.G-CO.4.12 MAFS.912.G-MG.1.1,2,3 LAFS.910.W.3.7,8,9 LAFS.910.SL.2.4,5,6	SC.912.N.1.1 SC.912.L.14.6 SC.912.L.17.13, 16, 17
04.04	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.	LAFS.910.W.3.7,8,9 LAFS.910.SL.2.4,5,6	SC.912.N.1.1 SC.912.L.14.6 SC.912.L.17.13, 16, 17
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.	LAFS.910.SL.1.1 LAFS.910.RI.4.10	
05.02	Identify and distinguish construction project management occupations and the roles and responsibilities of each.	LAFS.910.SL.1.1 LAFS.910.RI.4.10	
05.03	Identify and differentiate design and engineering occupations and the roles and responsibilities of each.	LAFS.910.SL.1.1 LAFS.910.RI.4.10	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
05.04 Assess the relationship between the Department of Labor and the construction industry, economy and employment.	LAFS.910.SL.1.1,2	
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.	LAFS.910.SL.1.1 LAFS.910.SL.2.4	
06.02 Develop personal career plan that includes goals, objectives and strategies.	LAFS.910.W.2.4 LAFS.910.W.1.2	
06.03 Examine and explain licensing, certification and industry credentialing requirements.	LAFS.910.RI.4.10 LAFS.910.RI.1.1 LAFS.910.SL.1.2	
06.04 Maintain a career portfolio to document knowledge, skills and experience.	LAFS.910.W.2.4,5,6	
06.05 Evaluate and compare employment opportunities that match career goals.	LAFS.910.RI.1.2 LAFS.910.RI.3.7	
06.06 Identify and exhibit traits for retaining employment.	LAFS.910.RI.1.2 LAFS.910.RI.3.7	
06.07 Identify opportunities and research requirements for career advancement.	LAFS.910.RI.1.2 LAFS.910.RI.3.7	
06.08 Research the benefits and necessity of ongoing professional development.	LAFS.910.W.3.7,8,9	
06.09 Examine and describe entrepreneurship and leadership opportunities as a career planning option.	LAFS.910.SL.1.1	
06.10 Conduct a job search and analyze the requirements of the job.	LAFS.910.RI.3.7,8 LAFS.910.W.2.6	
06.11 Understand the consequences of poor decision making.	LAFS.910.SL.1.1	
06.12 Assess the importance of confidentiality in the workplace.	LAFS.910.SL.1.1	
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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
07.0 Demonstrate rough and finish carpentry skills--The student will be able to:		
07.01 Discuss the carpentry trade and explain the duties of a carpenter.	LAFS.910.SL.1.1	
07.02 Identify and use building materials, fasteners and adhesives.	LAFS.910.L.3.6	SC.912.N.1.1
07.03 Use and maintain hand and power tools.		
07.04 Read and interpret approved plans and specifications for residential and commercial drawings.	MAFS.912.G-GMD.2.4 MAFS.912.G-MG.1.1,2,3 LAFS.910.SL.1.1 LAFS.910.RI.1.1,2	SC.912.N.1.1
07.05 Apply linear and distance measurements, leveling, plumbing and squaring techniques.	MAFS.912.G-CO.1.1	
07.06 Analyze a survey and develop site layout.	MAFS.912.F-TF.3.8 MAFS.912.G-CO.3.9 LAFS.910.SL.1.1 LAFS.910.RI.1.1,2	SC.912.N.1.1 SC.912.L.17.16, 17, 20
07.07 Construct and remove concrete forms, handle and place concrete, reinforcing materials and finish concrete.	MAFS.912.G-CO.4.12	
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.	MAFS.912.F-TF.3.8 MAFS.912.F-TF.3.9 MAFS.912.G-MG.1.1,2,3	SC.912.N.1.1

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
07.10 Calculate, layout, construct and install basic stair layout.	MAFS.912.F-TF.3.8 MAFS.912.F-TF.3.9 MAFS.912.G-MG.1.1,2,3	SC.912.N.1.1
07.11 Understand building science of thermal and moisture protection and mitigating measures.	MAFS.912.G-MG.1.2 LAFS.910.SL.1.1	SC.912.N.1.1 SC.912.P.10.2,4,5 ,6 SC.912.L.14.6
07.12 Calculate and install roofing applications.	MAFS.912.G-MG.1.1,2,3	SC.912.N.1.1
07.13 Install windows and interior /exterior doors and door hardware.	MAFS.912.G-MG.1.1,2,3	SC.912.N.1.1
07.14 Calculate, construct and install exterior finishing.	MAFS.912.G-MG.1.1,2,3	SC.912.N.1.1
07.15 Install drywall and apply finishing techniques.	MAFS.912.G-MG.1.1,2,3	SC.912.N.1.1
07.16 Install cabinets and built-in fabrications.	MAFS.912.G-MG.1.1,2,3	SC.912.N.1.1
07.17 Calculate and install window, door, floor and ceiling trim.	MAFS.912.G-MG.1.1,2,3	SC.912.N.1.1
07.18 Calculate, layout and construct cold-formed steel framing.	MAFS.912.G-MG.1.1,2,3	SC.912.N.1.1
07.19 Calculate, layout and install suspended ceilings.	MAFS.912.G-MG.1.1,2,3	SC.912.N.1.1
08.0 Demonstrate masonry skills--The student will be able to:		
08.01 Describe and discuss orientations to the masonry trade.	LAFS.910.SL.1.1 LAFS.910.RI.1.1 LAFS.910.RI.4.10	
08.02 Identify and select basic masonry tools and equipment.	LAFS.910.L.3.6	
08.03 Use, maintain and store masonry hand tools, power tools and equipment safely and in proper working order.		SC.912.N.1.1
08.04 Read and interpret measurements, drawings and specifications for masonry building projects.	LAFS.910.SL.1.1 LAFS.910.RI.1.1,2	SC.912.N.1.1
08.05 Demonstrate safe and proper procedures for set up / tear down and maintaining masonry work sites and projects.	LAFS.910.SL.1.1	SC.912.N.1.1
08.06 Utilize the tools and equipment used for mixing mortar.		SC.912.N.1.1
08.07 Analyze the factors that affect the consistency of mortar.	MAFS.912.F-IF.2.6 LAFS.910.RI.3.7	SC.912.P.8.1
08.08 Determine masonry ratios, their strengths and applications of mortar mixtures M, S, N, O and K.	MAFS.912.F-IF.2.6 LAFS.910.RI.3.7	SC.912.N.1.1
08.09 Mix various types of mortar, considering application and pounds per square inch (PSI) strength.	MAFS.912.F-IF.2.6 LAFS.910.RI.3.7	SC.912.N.1.1

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
08.10	Lay out square corners using the 3-4-5 (or Pythagorean Theorem) and building instrument methods for masonry projects.	MAFS.912.F-TF.3.8,9 MAFS.912.G-SRT.3.6,7,8	
08.11	Lay out and install dry bonds for masonry block corner leads projects.	MAFS.912.F-TF.3.8,9	
08.12	Lay out and build corner leads for masonry block projects.	MAFS.912.G-SRT.3.6,7,8	
08.13	Identify and describe various masonry units and installation techniques.	MAFS.912.G-CO.4.12 LAFS.910.SL.1.1 LAFS.910.RI.1.2	SC.912.N.1.1
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.	LAFS.910.SL.1.1 LAFS.910.RI.1.2	
08.17	Mix and apply stucco to a project.		SC.912.N.1.1
09.0	Demonstrate painting and decorating skills--The student will be able to:		
09.01	Identify, describe and use various painting tools and equipment.	LAFS.910.SL.1.1 LAFS.910.RI.1.2	SC.912.N.1.1
09.02	Properly erect an extension ladder, step ladder and a scaffold.	MAFS.912.F-IF.2.6 MAFS.912.S-ID.3.7	
09.03	Prepare surfaces for application of finishes.		
09.04	Identify and describe various painting and application techniques.	LAFS.910.SL.1.1 LAFS.910.RI.1.2	SC.912.N.1.1
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.		SC.912.N.1.1



**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
10.0 Demonstrate science knowledge and skills--The students will be able to:		
10.01 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.	MAFS.912.G-MG.1.2 LAFS.1112.RI.4.10	SC.912.N.1.1 SC.912.P.10.2,4,5,6 SC.912.L.14.6
10.02 Discuss the role of creativity in constructing scientific questions, methods and explanations.	LAFS.1112.SL.1.1	SC.912.N.1.1,2,3 SC.912.N.1.7
10.03 Formulate scientifically investigable questions, construct investigations, collect and evaluate data and develop scientific recommendations based on findings.	LAFS.1112.SL.1.1 LAFS.1112.W.3.7,8	SC.912.N.1.1,3,4,5
10.04 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.)	LAFS.1112.SL.1.1	SC.912.N.1.1 SC.912.L.14.6 SC.912.L.17.13
10.05 Explain pressure measurement in terms of PSI and inches of mercury.	MAFS.912.G-MG.1.2 LAFS.1112.SL.1.1	SC.912.N.1.1
10.06 Explore new technology as it applies to the construction industry in terms of materials, processes and the need for continuing education.		SC.912.N.1.1
10.07 Compare and analyze traditional and digital media to learn how technology has altered opportunities for innovative responses and results.	LAFS.1112.W.3.7,8	SC.912.L.17.11, 15
10.08 Investigate the use of communication technology and other resources to inspire design decisions.	LAFS.1112.W.3.7,8	SC.912.L.17.11, 15
11.0 Demonstrate mathematics knowledge and skills--The students will be able to:		

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
11.01	Solve job-related problems by adding, subtracting, multiplying and dividing numbers using fractions, decimals and whole numbers.	MAFS.912.N-Q.1.1,2,3	
11.02	Change fractions and decimals to percent.	MAFS.912.N-Q.1.1,2,3	
11.03	Solve job-related problems using a calculator for basic computations.	MAFS.912.N-Q.1.1,2,3	
11.04	Read a ruler and a tape measure accurately.	MAFS.912.N-Q.1.1,2,3	SC.912.N.1.1
11.05	Compute yards, feet, inches and fractions of inches.	MAFS.912.N-Q.1.1,2,3	
11.06	Change hours and minutes to decimals, fractions and mixed numbers.	MAFS.912.N-Q.1.1,2,3	
11.07	Construct charts/tables/graphs using functions and data.	MAFS.912.N-Q.1.1,2,3	SC.912.N.1.1
11.08	Determine ratios and proportions.	MAFS.912.N-Q.1.1,2,3 MAFS.912.G-CO.4.12 MAFS.912.G-SRT.3.8	
11.09	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares and cylinders.	MAFS.912.G-GMD.1.1,2,3 MAFS.912.G-GMD.2.4	
11.10	Measure tolerance(s) on horizontal and vertical surfaces using metric (centimeters and millimeters) and English (feet, inches and fractions).	MAFS.912.N-Q.1.1,2,3 MAFS.912.S-IC.2.4	
11.11	Analyze and apply data and measurements to solve problems and interpret documents.	MAFS.912.S-ID.1.1,2,3,4 LAFS.1112.SL.1.1 LAFS.1112.RI.1.1,2 LAFS.1112.RI.3.7	SC.912.N.1.1
11.12	Calculate man hours and labor costs for a specific job.	MAFS.912.N-Q.1.1,2,3	
12.0	Explain all that the built environment encompasses--The student will be able to:		
12.01	Research the development of construction technology, its impact on the built environment and the impact of growth on the construction industry.	LAFS.1112.W.3.7,8,9	SC.912.N.1.1 SC.912.L.17.12,13,14,15,16,17,18
12.02	Describe and give examples of the influences and benefits of the construction industry on health and safety, communication, transportation and the economy.	LAFS.1112.SL.1.1 LAFS.1112.W.2.4	SC.912.N.1.1 SC.912.L.14.6 SC.912.L.17.12,13,14,15,16,17,18
12.03	Examine and compare the relationship between the built environment and the natural environment.	LAFS.1112.SL.1.1	SC.912.N.1.1 SC.912.L.17.12,13,14,15,16,17,18

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
12.04	Compare architectural designs and/or models to understand how technical and utilitarian components impact aesthetic qualities.	LAFS.1112.SL.1.1 LAFS.1112.RI.3.7	SC.912.N.1.1 SC.912.N.3.5
12.05	Analyze changes in architectural styles and construction practices over time relative to various environments.	LAFS.1112.SL.1.1 LAFS.1112.RI.3.7	SC.912.N.1.1
12.06	Describe the significance of major architects, engineers or inventors to understand their historical influences.	LAFS.1112.SL.1.1	SC.912.N.1.1 SC.912.N.2.5
12.07	Research innovative historical architectural and/or engineering works and examine the significance of their legacy for the future.	LAFS.1112.W.3.7,8,9	SC.912.N.1.1 SC.912.N.2.5
12.08	Identify transitions in design media, technique and focus to explain how technology has changed design throughout history.	LAFS.1112.RI.1.2	SC.912.N.1.1
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.	MAFS.912.S-ID.2.5 MAFS.912.S-CP.1.4,5 MAFS.912.S-MD.1.1,2,3,4 MAFS.912.S-MD.2.5,6,7 LAFS.1112.RI.1.2,3	SC.912.N.1.1 SC.912.L.17.1 SC.912.L.17.10,11,12,13,14,15,16,17,18,19,20 SC.912.L.17.7,8,9
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.	MAFS.912.S-ID.2.5 MAFS.912.S-CP.1.4,5 MAFS.912.S-MD.1.1,2,3,4 MAFS.912.S-MD.2.5,6,7 LAFS.1112.SL.1.1 LAFS.1112.RI.1.1,2	SC.912.N.1.1 SC.912.L.17.1,7,8,9,10,11,12,13,14,15,16,17,18,19,20
13.03	Examine and compare the relationship between a green built environment and the natural environment.	MAFS.912.S-ID.2.5 MAFS.912.S-CP.1.4,5 MAFS.912.S-MD.1.1,2,3,4 MAFS.912.S-MD.2.5,6,7 LAFS.1112.SL.1.1 LAFS.1112.RI.3.7	SC.912.N.1.1 SC.912.L.17.1,7,8,9,10,11,12,13,14,15,16,17,18,19,20
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.	MAFS.912.S-ID.2.5 MAFS.912.S-CP.1.4,5 MAFS.912.S-MD.1.1,2,3,4 MAFS.912.S-MD.2.5,6,7 LAFS.1112.SL.1.1 LAFS.1112.RI.3.9	SC.912.N.1.1 SC.912.N.4.1

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	LAFS.1112.RI.4.10	
13.05 Research sustainable building design and its relationship between health, energy efficiency and money savings for government, businesses and individuals.	MAFS.912.S-ID.2.5 MAFS.912.S-CP.1.4,5 MAFS.912.S-MD.1.1,2,3,4 MAFS.912.S-MD.2.5,6,7 LAFS.1112.W.3.7,8,9	SC.912.N.1.1 SC.912.N.4.1,2 SC.912.L.17.1,7,8,9,10,11,12,13,14,15,16,17,18,19,20
13.06 Research the effects of building science on construction and energy efficiency.	MAFS.912.S-ID.2.5 MAFS.912.S-CP.1.4,5 MAFS.912.S-MD.1.1,2,3,4 MAFS.912.S-MD.2.5,6,7 LAFS.1112.W.3.7,8,9	SC.912.N.1.1 SC.912.N.4.2 SC.912.L.17.11
13.07 Research renewable fuels and energy.	MAFS.912.S-ID.2.5 MAFS.912.S-CP.1.4,5 MAFS.912.S-MD.1.1,2,3,4 MAFS.912.S-MD.2.5,6,7 LAFS.1112.W.3.7,8,9	SC.912.N.1.1 SC.912.L.17.11,19

**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.	LAFS.1112.SL.1.1 LAFS.1112.RI.1.3	SC.912.N.1.1 SC.912.N.4.1,2
14.02	Identify and analyze the Codes of Federal Regulations (CFR) pertaining to the construction industry.	LAFS.1112.SL.1.1 LAFS.1112.RI.3.9 LAFS.1112.RI.4.10	
14.03	Analyze the Florida State Statues pertaining to the construction industry.	LAFS.1112.SL.1.1 LAFS.1112.RI.3.9 LAFS.1112.RI.4.10	
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.	LAFS.1112.SL.1.1 LAFS.1112.RI.3.7	SC.912.N.1.1
14.05	Compare and contrast employment and training with union and non-union entities in the construction industry.	LAFS.1112.SL.1.1	
14.06	Examine the role of apprenticeship in the construction industry and its impact on education.	LAFS.1112.SL.1.1	
14.07	Research and assess the Florida Department of Business and Professional Regulation.	LAFS.1112.SL.1.1 LAFS.1112.RI.3.9 LAFS.1112.RI.4.10	
14.08	Research and assess the Construction Industry Licensing Board, its structure, polices and requirements.	LAFS.1112.SL.1.1 LAFS.1112.RI.3.9 LAFS.1112.RI.4.10	
14.09	Research various construction occupations and explain the requirements for becoming licensed.	LAFS.1112.SL.1.1 LAFS.1112.RI.3.9	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
		LAFS.1112.RI.4.10	
14.10	Compare and contrast the roles and responsibilities of the engineers, architects/designers and the general contractor.	LAFS.1112.SL.1.1 LAFS.1112.RI.3.7	
14.11	Compare and contrast the roles and responsibilities of the general contractor, subcontractors, specialty contractors and employees of contractors.	LAFS.1112.SL.1.1 LAFS.1112.RI.3.7	
14.12	Identify and differentiate the roles and responsibilities of building construction firms and classifications of construction projects.	LAFS.1112.SL.1.1	
14.13	Understand the process of establishing a business in the construction industry.	LAFS.1112.L.3.6	
14.14	Assess the relationship between the Department of Labor and new construction projects, new permits and new business start-ups.	LAFS.1112.SL.1.1 LAFS.1112.RI.1.2	
14.15	Understand zoning and assess the need for and impact of zoning requirements on construction projects.	LAFS.1112.SL.1.1 LAFS.1112.RI.1.2	SC.912.N.1.1 SC.912.N.4.1,2 SC.912.L.17.1,8,12,13, 14,15,16,20
14.16	Examine and analyze the process of applying for building permits and variances.	LAFS.1112.SL.1.1 LAFS.1112.RI.1.2	SC.912.N.1.1 SC.912.L.17.1,8,12,13, 14,15,16,20
15.0	Develop a basic understanding of construction contracts 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.	LAFS.1112.SL.1.1 LAFS.1112.RI.1.1,2	
15.02	Analyze the importance of building codes and zoning regulations on the development of drawings and specifications.	LAFS.1112.SL.1.1 LAFS.1112.RI.1.1,2 LAFS.1112.RI.3.7	SC.912.N.1.1 SC.912.N.4.1,2 SC.912.L.17.1,8,12,13, 14,15,16,20
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 and schedules), structural, plumbing, mechanical and electrical drawings.	LAFS.1112.SL.1.1 LAFS.1112.RI.1.1,2 LAFS.1112.RI.3.7	
15.04	Utilize building symbols, drawing lines, abbreviations and scale in the development of blueprints.	LAFS.1112.L.3.6	
15.05	Prepare lists of materials and specifications.	LAFS.1112.W.2.4	
15.06	Use architectural and engineering scales.	MAFS.912.G- CO.4.12 MAFS.912.N- Q.1.1,2,3 LAFS.1112.W.2.4	
15.07	Demonstrate the basic use of computer-aided design software.	LAFS.1112.W.2.6	
15.08	Demonstrate the use of computer aided drafting (CAD) software to prepare project	MAFS.912.G-	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
drawings.	CO.4.12 MAFS.912.N- Q.1.1,2,3 LAFS.1112.W.2.6	
15.09 Write specifications for a project.	LAFS.1112.W.2.4 LAFS.1112.W.3.7	
15.10 Prepare construction documents for a project.	LAFS.1112.W.2.4	

**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
16.0 Demonstrate 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.)	LAFS.1112.SL.1.1	SC.912.N.1.1 SC.912.P.10.1,13,14, 15,16,17,18,19,21
16.02 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).	MAFS.912.N-Q.1.1,2,3 MAFS.912.N-CN.1.1,2,3 LAFS.1112.SL.1.1 LAFS.1112.RI.1.2	SC.912.N.1.1 SC.912.P.10.1,13,14, 15,16,17,18,19,21
16.03 Design and calculate electrical loads using ohms law to determine power, American wire gauge (AWG) and electrical equipment sizes.	MAFS.912.N-Q.1.1,2,3 LAFS.1112.RI.3.7 LAFS.1112.W.2.4	SC.912.N.1.1
16.04 Apply basic electrical theory to wiring a project.	MAFS.912.N-CN.1.1,2,3	SC.912.P.10.1,13,14, 15,16,17,18,19,21
16.05 Design and install a branch circuit system in a project.	MAFS.912.N-Q.1.1,2,3 LAFS.1112.RI.3.7 LAFS.1112.W.2.4	SC.912.N.1.1
16.06 Explain grounding, its purpose and relation to electrical safety.		
16.07 Install Ground Fault Circuit Interrupter (GFCI) circuitry.	MAFS.912.N-CN.1.1,2,3	SC.912.P.10.1,13,14, 15,16,17,18,19,21



<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
16.08	Troubleshoot electrical systems, using testing and metering devices.	MAFS.912.N-Q.1.1,2,3	SC.912.N.1.1
16.09	Install a meter, distribution panel and breaker panel for a project.		SC.912.P.10.1,13,14,15,16,17,18,19,21
16.10	Identify types of wiring raceways (EMT / IMC / PVC / MC Cable / Romex / SE Cable / UF Cable).	LAFS.1112.SL.1.1	SC.912.N.1.1
16.11	Install conduit, pipe, shielded electrical cable and electrical boxes in a project.		SC.912.P.10.1,13,14,15,16,17,18,19,21
17.0	Demonstrate finish electrical skills--The student will be able to:		
17.01	Install electrical components relating to residential & commercial applications.		
17.02	Wire an air-conditioning system, heat exchanger, heat pump or electric water heater into an electrical supply and properly size wire and overcurrent protection.		
17.03	Troubleshoot and inspect electrical systems.		SC.912.N.1.1 SC.912.P.10.1,13,14,15,16,17,18,19,21
18.0	Demonstrate 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.	MAFS.912.G-CO.4.12 MAFS.912.G-C.1.1 MAFS.912.G-C.2.5 LAFS.1112.L.3.6	SC.912.N.1.1 SC.912.L.17.14,19
18.02	Lay out and install a water distribution system for a project.	MAFS.912.G-CO.4.12 MAFS.912.G-C.1.1 MAFS.912.G-C.2.5	SC.912.N.1.1 SC.912.L.17.14,19
18.03	Lay out and install a drain-waste-and-vent system for a project.	MAFS.912.G-CO.4.12 MAFS.912.G-C.1.1 MAFS.912.G-C.2.5	SC.912.N.1.1 SC.912.L.17.14,19
18.04	Test and inspect plumbing systems.		SC.912.N.1.1 SC.912.L.17.14,19
18.05	Design, layout and install a domestic solar hot water system.		
19.0	Demonstrate 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.		SC.912.N.1.1
19.02	Install kitchen fixtures and hardware such as sinks, garbage disposals, faucets, dishwasher, icemaker and hot-water-heater tanks.		SC.912.N.1.1
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.	LAFS.1112.SL.1.1 LAFS.1112.W.2.4	SC.912.N.1.1 SC.912.P.10.4,7,14

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
20.02 Perform basic calculations for heating and cooling loads.	MAFS.912.A-REI.1.1,2 MAFS.912.S-IC.2.4	SC.912.P.10.4,7,14
20.03 Develop an understanding of building envelope, insulation and ventilation.		
20.04 Select and install the components of an air conditioning system for a project including ductwork, coolant lines, compressor packages and coil packages.	MAFS.912.A-REI.1.1,2 MAFS.912.S-IC.2.4 LAFS.1112.L.3.6 LAFS.1112.RI.3.7	SC.912.N.1.1 SC.912.P.10.4,7,14
20.05 Identify and select refrigerants according to their properties.	LAFS.1112.L.3.6 LAFS.1112.RI.3.7	SC.912.P.10.4,7,14
21.0 Demonstrate finish heating, ventilation and air conditioning (HVAC) skills--The student will be able to:		
21.01 Determine a refrigerant level.	LAFS.1112.RI.3.7	SC.912.N.1.1 SC.912.P.10.4,7,14
21.02 Install a control system for a project.		SC.912.N.1.1
21.03 Install registers for a project.		SC.912.N.1.1
21.04 Examine computer-monitoring systems associated with Heating, Ventilation and Air-Conditioning (HVAC) control systems and air-quality management.	LAFS.1112.RI.3.7	SC.912.N.1.1

**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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, through convergent and divergent thinking, 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 critical thinking skills for various contexts to develop, refine and reflect on a design theme.		
22.04	Use and maintain tools and equipment to facilitate design and construction process.		
22.05	Work in a project team to show creative cohesiveness, team building, respectful compromise and time-management skills.		
22.06	Apply carpentry skills.		
22.07	Apply masonry skills.		
22.08	Apply mechanical, electrical and plumbing (MEP) skills.		
22.09	Apply construction industry safety.		
22.10	Apply sustainable construction practices.		
22.11	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.

### **Special Notes**

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the postsecondary program with the same Classification of Instructional Programs (CIP) number.

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

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	0646010103
Grade Level	9-12, 30, 31
Standard Length	5 Credits
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-3011- Helpers—Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters 47-2021- Brickmasons and Blockmasons

**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 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.

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:

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

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

### Academic Alignment Tables

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8722610	**	**	**	**	**	**	**	**	**	**	**
8722620	**	**	**	**	**	**	**	**	**	**	**
8722630	**	**	**	**	**	**	**	**	**	**	**
8722640	**	**	**	**	**	**	**	**	**	**	**
8722650	**	**	**	**	**	**	**	**	**	**	**

\*\* Alignment pending review

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8722610	**	**	**	**	**	**	**
8722620	**	**	**	**	**	**	**
8722630	**	**	**	**	**	**	**
8722640	**	**	**	**	**	**	**
8722650	**	**	**	**	**	**	**

\*\* Alignment pending review

### Florida Standards for Technical Subjects

*Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education.*

**Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.**

**Florida Standards for English Language Development (ELD)**

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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.



## **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.
- 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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
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 (MSDSs).		
02.08 Demonstrate the use of and care of appropriate personal protective equipment (PPE).		
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" corner return leads and a wall 4 feet high and 12 feet 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 Identify power tools.		
05.04 Read ruler to the 1/16".		
05.05 Read brick-spacing rules and brick modular rules.		
05.06 Course brick to a given height with the brick spacing rule and the modular rule.		

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
06.0	Demonstrate understanding of 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. Customary (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	Temper mortar.		
08.03	Spread mortar for brick.		
08.04	Pull a line from established leads.		
08.05	Butter head joints.		
08.06	Lay brick to the line.		
08.07	Maintain proper spacing of head and bed joints.		
08.08	Cut brick with a hammer, a brick set and a trowel.		
08.09	Point and tool joints in brick walls.		
08.10	Repeat the above nine tasks with 8" concrete block.		
08.11	Demonstrate proper handling of materials to prevent damage.		

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
09.0 Describe the various types and uses of bonding--The student will be able to:		
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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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 common admixtures and their uses.		
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.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
10.11 Build a brick 4" corner return lead.		
10.12 Identify common problems found in mortar application and their uses.		
11.0 Demonstrate science knowledge and skills--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 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.		



<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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) 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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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	Lay out and build chimneys and fireplaces.		
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.		
18.06	Place grout in a hollow block wall and rod it into place.		
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	Install hollow metal frames.		
19.05	Describe the functions of sills and lintels.		
19.06	Install sills and lintels.		
19.07	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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
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 leaser leveling instruments, transit and leveling rod.		
21.05 Build batter boards and establish building lines and elevations.		
21.06 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 Build various types of walls using proper reinforcement, jointing and bonding techniques.		
22.04 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.		
23.0 Apply construction techniques and moisture control—The student will be able to:		
23.01 Construct masonry around windows, doors and other openings.		
23.02 Construct pilasters and other types of bracing.		
23.03 Install various types of insulation used in conjunction with masonry construction.		
23.04 Identify the need for moisture control in various types of masonry construction, and demonstrate the techniques used to eliminate moisture problems.		
23.05 Construct corbelling in a double-wythe wall.		
23.06 Join intersecting walls.		
23.07 Install flashing.		
24.0 Apply quality control measures—The student will be able to:		

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSS-Sci</b>
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.		

**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		
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 foundation walls to floor elevations.		
25.07 Make foundation walls waterproof, if required.		
25.08 Install 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.		

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		



## **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.

### **Special Notes**

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the postsecondary program with the same Classification of Instructional Programs (CIP) number.

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

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, 30, 31
Standard Length	7 Credits
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9021 - Heating, Air Conditioning, and Refrigeration Mechanics and Installers

**Purpose**

The purpose of this program is to prepare students for employment or advanced training in the heating, air-conditioning and refrigeration and ventilation 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 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.

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:

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

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

### Academic Alignment Tables

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8713010	**	**	**	**	**	**	**	**	**	**	**
8713020	**	**	**	**	**	**	**	**	**	**	**
8713030	**	**	**	**	**	**	**	**	**	**	**

8713040	**	**	**	**	**	**	**	**	**	**	**
8713050	**	**	**	**	**	**	**	**	**	**	**
8713060	**	**	**	**	**	**	**	**	**	**	**
8713070	**	**	**	**	**	**	**	**	**	**	**

\*\* Alignment pending review

# Alignment attempted, but no correlation to academic course

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8713010	**	**	**	**	**	**	**
8713020	**	**	**	**	**	**	**
8713030	**	**	**	**	**	**	**
8713040	**	**	**	**	**	**	**
8713050	**	**	**	**	**	**	**
8713060	**	**	**	**	**	**	**
8713070	**	**	**	**	**	**	**

\*\* Alignment pending review

# Alignment attempted, but no correlation to academic course

### **Florida Standards for Technical Subjects**

*Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education.*

**Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.**

### **Florida Standards for English Language Development (ELD)**

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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.

## **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 Identify, use and maintain the tools and tool accessories used in the heating, air-conditioning and refrigeration industry.
- 03.0 Demonstrate mathematics knowledge and skills.
- 04.0 Demonstrate a practical knowledge of basic electricity and of the electrical components of heating, air-conditioning and refrigeration equipment.
- 05.0 Troubleshoot heating, air-conditioning and refrigeration electrical control systems and their components.
- 06.0 Select and test electrical generation and distribution components for commercial heating and air conditioning systems.
- 07.0 Maintain, test and troubleshoot electrical motors and their components for commercial heating and air-conditioning systems.
- 08.0 Troubleshoot and wire electrical motors and their components.
- 09.0 Operate solid-state electronics as used in heating, air-conditioning and refrigeration systems.
- 10.0 Evaluate single-phase and three-phase power as used in heating, air-conditioning and refrigeration systems.
- 11.0 Explain the function of basic electronics.
- 12.0 Describe the history and concepts of heating, air-conditioning and refrigeration.
- 13.0 Explain the properties of matter and heat behavior.
- 14.0 Analyze fluids, pressures, refrigerants and related codes.
- 15.0 Evaluate heating, air-conditioning and refrigeration system components and accessories.
- 16.0 Select appropriate commercial compressors.
- 17.0 Test and adjust commercial evaporative condensers.
- 18.0 Maintain, test and troubleshoot commercial evaporators.
- 19.0 Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
- 20.0 Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing.
- 21.0 Utilize and operate mechanical refrigeration servicing and testing equipment.
- 22.0 Assist in the installation of a residential heating and air-conditioning system and determine start-up procedures.
- 23.0 Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems.
- 24.0 Demonstrate a working knowledge of refrigerants and oils.
- 25.0 Conduct system startup and shutdown.
- 26.0 Explain the importance of employability and entrepreneurship skills
- 27.0 Use combustion-type heating servicing and testing equipment.
- 28.0 Troubleshoot combustion gas valves and regulators as used in heating, air-conditioning, refrigeration and ventilation systems.
- 29.0 Maintain, troubleshoot and repair commercial heating systems.
- 30.0 Explain how to install, maintain and repair heating, air-conditioning and refrigeration systems.
- 31.0 Demonstrate knowledge of retail refrigeration systems.
- 32.0 Demonstrate knowledge of commercial and industrial refrigeration systems.
- 33.0 Develop an understanding of hydronic 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 essential to the air conditioning, refrigeration and heating industry. These competencies include knowledge and skills related to safety practices, history and concepts, materials and tools, and troubleshooting electrical control systems.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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 and use 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	Understand and apply Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), 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-		



CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
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 Follow safety precautions when using hand and power tools.		
01.12 Explain emergency procedures to follow in response to workplace accidents.		
01.13 Create a disaster and/or emergency response plan.		
02.0 Identify, use and maintain the tools and tool accessories used in the heating, air-conditioning and refrigeration industry--The student will be able to:		
02.01 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.		
02.02 Apply appropriate care and maintenance procedures for tools and tool accessories, following the directions in the tool-equipment manufacturer's manual.		
03.0 Demonstrate mathematics knowledge and skills--The student 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.		
04.0 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:		
04.01 Explain the principles of electricity.		
04.02 Explain single- and three-phase power distribution.		
04.03 Define and explain watts, ohms, volts and amps.		
04.04 Identify and explain electrical measuring tools and devices.		
04.05 Explain the standards for and ways to measure watts, resistance, voltage and amperage, using appropriate instruments or devices.		
04.06 Identify and explain appropriate electrical wiring symbols.		
04.07 Draw and explain a wiring schematic diagram for a control system.		
04.08 Create a wiring schematic for an air conditioner an electric furnace, a heat pump, an oil furnace (optional) and a gas furnace.		
04.09 Explain codes and standards and safety requirements for working with the electrical components used in heating, air conditioning and refrigeration.		

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
04.10	Troubleshoot protection devices, such as fuses and breakers.		
05.0	Troubleshoot heating, air-conditioning and refrigeration electrical control systems and their components--The student will be able to:		
05.01	Identify and explain the operations of electrical control systems and their components (zone damper motors, dual fuel lock out controls, outdoor thermostats/low ambient controls, defrost controls/timers and auxiliary heating controls, contactors, relays, circuit boards, motors, solenoids, and thermostats.).		
05.02	Identify, install and troubleshoot controls for heating, air-conditioning and refrigeration systems.		
05.03	Explain the operation of different types of electromechanical communicating, humidity control, and Wi-Fi operating thermostats.		
05.04	Wire basic heating, air-conditioning and refrigeration systems.		
05.05	Troubleshoot operational problems for different types of electromechanical communicating, humidity control, and Wi-Fi operating thermostats.		
05.06	Explain the electrical and mechanical operations of the basic heat pump.		
06.0	Select and test electrical generation and distribution components for commercial heating and air conditioning systems--The student will be able to:		
06.01	Determine wire sizes and voltage drops.		
06.02	Describe the operation of various types of transformers.		
06.03	Draw and identify various power-transformers.		
06.04	Test, size and replace protection devices such as fuses and breakers, motor starters and overloads.		

**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 covers competencies in electric motors, solid state electronics, single and three-phase power and basic electronics.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
07.0 Maintain, test and troubleshoot electrical motors and their components for commercial heating and air-conditioning systems--The student will be able to:		
07.01 Explain how alternating current is developed and draw a sine wave.		
07.02 Identify single-phase and three-phase wiring arrangements.		
07.03 Explain how phase shift occurs in inductors and capacitors.		
07.04 Describe the types of capacitors and their applications.		
07.05 Explain the operation of single-phase and three-phase induction motors.		
07.06 Identify the various types of single-phase motors and their applications.		
07.07 Identify and explain the operations and applications of various types of electrical motors and their components as used in commercial heating and air-conditioning systems.		
07.08 Maintain, test and troubleshoot various types of commercial electrical motors and their components as used in commercial heating and air-conditioning systems.		
07.09 Demonstrate the proper use of motor testing equipment.		
08.0 Troubleshoot and wire electrical motors and their components--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
08.01 Identify and explain the functions of various types of motors and their components.		
08.02 Troubleshoot, test and analyze motors, using various methods.		
08.03 Identify, troubleshoot and wire various types of electric motors.		
08.04 Reverse the rotation of a motor.		
09.0 Operate solid-state electronics as used in heating, air-conditioning and refrigeration systems-- The student will be able to:		
09.01 Explain the basic principles and functions of Direct Digital Control (DDC).		
09.02 Explain basic solid-state circuits and boards.		
09.03 Identify, test and replace circuits and boards.		
09.04 Program a programmable thermostat.		
10.0 Evaluate single-phase and three-phase power as used in heating, air-conditioning and refrigeration systems --The student will be able to:		
10.01 Explain how the principles of designing an electrical system for residential heating and air-conditioning systems apply to commercial heating and air-conditioning systems.		
10.02 Define and compare single- and multiphase voltage and current related to commercial heating and air-conditioning systems.		
10.03 Calculate various circuit loads in commercial heating and air-conditioning applications using Ohm's law.		
10.04 Troubleshoot electrical circuits for commercial heating and air-conditioning systems		
11.0 Explain the function of basic electronics--The student will be able to:		
11.01 Explain the basic theory of electronics and semiconductors.		
11.02 Explain how various semiconductor devices such as diodes, LEDs and photo diodes work, and how they are used in power and control circuits.		
11.03 Identify different types of resistors and explain how their resistance values can be determined.		
11.04 Describe the operation and function of thermistors.		

**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 covers competencies in construction documents; history of the profession; science; matter and heat and behavior; fluids, pressures, refrigerants and codes; and components and accessories.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
12.0	Describe the history and concepts of heating, air-conditioning and refrigeration--The student will be able to:		
12.01	Explain the basic principles of heating, ventilation and air-conditioning.		
12.02	Identify and explain the four major refrigeration components.		
12.03	Identify and explain the characteristics of a compression-cycle refrigerant system.		
12.04	Differentiate between air-conditioning and refrigeration.		
12.05	Differentiate between split systems and package systems.		
12.06	Describe the benefits of conditioned air and environments.		
12.07	Identify various professional organizations, associations and societies and explain their purposes.		
13.0	Explain the properties of matter and heat behavior--The student will be able to:		
13.01	Describe and explain freezing point, critical temperature and absolute zero.		
13.02	Explain the gas laws (Dalton, Boyle and Charles) used when dealing with air and its properties.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
13.03 Describe matter, heat and heat transfer.		
13.04 Differentiate between heat and temperature.		
13.05 Explain and distinguish among the characteristics of the three states of matter.		
13.06 Explain the relationship between temperature and humidity.		
13.07 Differentiate between latent heat and sensible heat.		
14.0 Analyze fluids, pressures, refrigerants and related codes--The student will be able to:		
14.01 Identify the refrigeration cycle.		
14.02 Identify and explain general safety issues and EPA rules and regulations regarding the handling of refrigerants.		
14.03 Define and explain pressure, fluid and temperature.		
14.04 Explain the standards for and ways to measure and calculate absolute and gauge pressures.		
14.05 Identify and explain the classifications, properties and uses of different refrigerants.		
14.06 Explain how fluids react and flow in a closed versus an open environment or vessel.		
14.07 Define and identify "color-coding" of refrigerant cylinders.		
14.08 Compare Pressure and Temperature (P/T) charts.		
14.09 Explain the proper methods of transferring, storing and recovering refrigerants.		
14.10 Explain the effects of an improper refrigerant and contaminants in a system.		
15.0 Evaluate heating, air-conditioning and refrigeration system components and accessories--The student will be able to:		
15.01 Explain the types, operation, use and maintenance requirements of		
a. Compressors (such as reciprocating, rotary, screw and scroll)		
b. Condensers and evaporators (such as evaporative condensers, evaporative coils, shell and tube, tube within a tube and fin and tube)		
c. Metering devices (such as adjusting automatic and thermostatic expansion valves, fixed orifices and other devices available on the local market)		
15.02 Evaluate metering-device performance.		

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSS-Sci</b>
15.03 Explain the methods of compression, lubrication and compressor loading and unloading.		
15.04 Analyze the operating condition of a compressor.		
15.05 Test, troubleshoot and correct the causes of mechanical problems in a heating, air-conditioning and refrigeration system.		
15.06 Identify the location and explain the uses of refrigerant flow accessories.		
15.07 Identify the location and explain the uses of heating, air-conditioning and refrigeration-system accessories (such as receivers, dryers/filters, solenoid valves, heat exchangers, accumulators, suction filter, oil separators, evaporator pressure-regulating valve, crankcase pressure-regulating valves, hot gas bypass valves and check valves).		
15.08 Evaluate system performance.		

**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 covers competencies in commercial compressors, condensers and evaporators; piping, tubing and fittings; and employability skills.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
16.0	Select appropriate commercial compressors--The student will be able to:		
16.01	Compare commercial-compressor requirements with those for residential and light commercial heating and air-conditioning systems.		
16.02	Discuss appropriate commercial compressors for cooling requirements.		
16.03	Describe the mechanical operation for each type of compressor.		
16.04	Explain compressor lubrication methods.		
16.05	Explain methods used to control compressor capacity.		
16.06	Describe how compressor protection devices operate.		
16.07	Perform the common procedures used when field servicing open and semi-hermetic compressors.		
17.0	Test and adjust commercial evaporative condensers--The student will be able to:		
17.01	Determine the proper air and fluid flow for commercial evaporative condensers.		
17.02	Test and adjust the airflow for proper temperature difference.		
17.03	Test and adjust the water flow for proper GPM and temperature difference.		



CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
17.04 Check for proper water treatment.		
18.0 Maintain, test and troubleshoot commercial evaporators--The student will be able to:		
18.01 Determine the operational requirements for evaporators used in commercial heating and air-conditioning applications.		
18.02 Discuss appropriate evaporators for commercial heating and air-conditioning systems		
18.03 Maintain, test and adjust various commercial heating and air-conditioning accessories.		
18.04 Maintain, test and adjust commercial heating and air-conditioning accessories.		
18.05 Compare commercial accessories with residential and light- commercial-heating and air-conditioning accessories.		
18.06 Select the heating and air-conditioning accessories appropriate for various commercial applications.		
19.0 Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry--The student will be able to:		
19.01 Identify and explain the purpose of the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.		
19.02 Bend tubing, using tube benders.		
19.03 Connect tubing using flared fittings and compression fittings.		
19.04 Connect tubing, using solderless connectors.		
19.05 Connect tubing, using a swaged-joint connection.		
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.		
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 heating, air-conditioning, refrigerant and ventilation accessories.		
19.13 Fabricate and leak-test the piping, tubing and fittings used in the heating, air-		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
conditioning and refrigeration industry.		
19.14 Demonstrate proper safety measures when fabricating and servicing piping, tubing and fittings.		

**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 covers competencies in ventilation pipe sizing; refrigeration servicing and testing; installation; startup and check out; and refrigerants and oils.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
20.0 Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing-- The student will be able to:		
20.01 Identify and explain various types of heating, air-conditioning and refrigeration piping.		
20.02 Identify basic principles of sizing various heating, air conditioning, refrigeration and ventilation for various tasks.		
20.03 Explain pressure and temperature drops.		
21.0 Utilize and operate mechanical refrigeration servicing and testing equipment--The student will be able to:		
21.01 Identify the effects of superheat and sub-cooling on a system.		
21.02 Identify and explain the functions of servicing and testing equipment (such as vacuum pumps, micron gauges, EPA-approved equipment, leak detectors and charging systems).		
21.03 Operate a refrigerant recovery system.		
21.04 Apply specific safety and recovery practices for refrigerants used in the industry.		
21.05 Apply specific safety practices as they relate to handling and storing cylinders and materials.		
21.06 Explain the standards for and ways to measure, test, maintain and evacuate a		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
mechanical heating, air-conditioning and refrigeration system.		
21.07 Evacuate the refrigerant system with various vacuum methods.		
21.08 Demonstrate compliance with Environmental Protection Agency (EPA) rules and regulations and, if possible, take the EPA test.		
21.09 Charge various air-conditioning and mechanical refrigeration systems by various methods.		
21.10 Demonstrate the effects of superheat and sub-cooling on a system utilizing test equipment (such as thermometers and gages).		
22.0 Assist in the installation of a residential heating and air-conditioning system and determine start-up procedures--The student will be able to:		
22.01 Read and comply with dispatch orders.		
22.02 Explain local codes and ordinances.		
22.03 Select and use appropriate tools and safety practices to test equipment.		
22.04 Determine the electrical requirements of equipment.		
22.05 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.		
22.06 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.		
22.07 Determine the temperature split/ difference across the evaporator.		
22.08 Determine the temperature split/ difference across the condenser.		
22.09 Write a service report.		
22.10 Apply good customer-relations skills.		
23.0 Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems--The student will be able to:		
23.01 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.		
23.02 Determine the start-up and checkout procedures recommended by different manufacturers.		
23.03 Determine the electrical requirements of equipment.		
23.04 Select and use appropriate tools, instruments and test equipment following safety precautions.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
23.05 Determine the temperature split/ difference across the outdoor coil on a heat pump.		
23.06 Determine the temperature split/ difference across the indoor coil on a heat pump.		
23.07 Apply good customer-relations skills.		
24.0 Demonstrate a working knowledge of refrigerants and oils--The student will be able to:		
24.01 Identify the refrigerants in common use and state the types of applications in which each is used.		
24.02 Explain the effects of releasing refrigerants into the atmosphere.		
24.03 Explain how refrigerants are classified by their chemical composition.		
24.04 Describe the color-coding scheme used to identify refrigerant cylinders.		
24.05 Describe how azeotropes and near-azeotropes differ from each other and from so-called pure refrigerants.		
24.06 Interpret a P-T chart for pure refrigerants, azeotrope, and near-azeotrope refrigerants and explain the difference between bubble point and dew point.”		
24.07 Demonstrate refrigerant leak detecting methods.		
24.08 Identify the different types of oils used in refrigeration systems and explain their relationships to the various refrigerants.		
24.09 Explain how to add and remove oil from a system.		
24.10 Describe how to test oil for contamination.		

**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 covers competencies in construction drawings and specifications; startup and shutdown; system design; combustion-type heating servicing and testing; troubleshooting; and installation.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
25.0 Conduct system startup and shutdown--The student will be able to:		
25.01 Start up and shut down an air handler and related forced-air distribution system.		
25.02 Test compressor oil for acid contamination.		
25.03 Add or remove oil from a semi-hermetic or open reciprocating compressor.		
26.0 Explain the importance of employability and entrepreneurship skills--The student will be able to:		
26.01 Identify and demonstrate positive work behaviors needed to be employable.		
26.02 Develop personal career plan that includes goals, objectives and strategies.		
26.03 Examine licensing, certification and industry credentialing requirements.		
26.04 Maintain a career portfolio to document knowledge, skills and experience.		
26.05 Evaluate and compare employment opportunities that match career goals.		
26.06 Identify and exhibit traits for retaining employment.		

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
26.07 Identify opportunities and research requirements for career advancement.		
26.08 Research the benefits of ongoing professional development.		
27.0 Use combustion-type heating servicing and testing equipment--The student will be able to:		
27.01 Explain combustion theory and the safety precautions for using combustion-type-heating servicing and testing equipment.		
27.02 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).		
27.03 Use the servicing and testing equipment.		
27.04 Test, analyze and troubleshoot combustion-type-heating systems.		
28.0 Troubleshoot combustion gas valves and regulators as used in heating, air-conditioning, refrigeration and ventilation systems--The student will be able to:		
28.01 Identify and discuss the safety and regulation issues and concerns.		
28.02 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).		
28.03 Identify various types of gas valves and regulators.		
28.04 Determine the application of gas valves and regulators.		
28.05 Troubleshoot gas valves and regulators.		
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 including a gas furnace and boiler, an oil furnace and boiler, an electric furnace, electric heaters, a heat pump and solar-heating systems.		
30.0 Explain how to install, maintain and repair heating, air-conditioning and refrigeration systems--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		

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
heating systems.		
30.03 Explain how to lay out, construct and troubleshoot comfort systems.		
30.04 Test and analyze systems.		
30.05 Test and analyze heat-recovery 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 covers competencies in retail, commercial and industrial refrigeration systems; hydronic systems; and steam systems.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
31.0 Demonstrate knowledge of retail refrigeration systems--The student will be able to:		
31.01 Describe the mechanical refrigeration cycle as it applies to retail refrigeration systems.		
31.02 Explain the differences in refrigerants and applications in low-, medium- and high-temperature refrigeration systems.		
31.03 Identify and describe the primary refrigeration cycle components used in retail refrigeration systems.		
31.04 Identify and describe the supporting components and accessories used in retail refrigeration systems.		
31.05 Describe the various methods of defrost used in retail refrigeration systems.		
31.06 Identify and describe the applications for the various types of retail refrigeration systems.		
31.07 Describe the control system components used in retail refrigeration systems.		
31.08 Explain the operating sequence of a retail refrigeration system.		
31.09 Interpret wiring diagrams and troubleshooting charts to isolate malfunctions in retail refrigeration systems.		
32.0 Demonstrate knowledge of commercial and industrial refrigeration systems--The student will be able to:		
32.01 Identify different types of refrigerated coolers and display cases and describe each one's common application.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
32.02 Compare the basic components used in commercial/industrial refrigeration systems with those used in retail refrigeration systems.		
32.03 Identify single, multiple and satellite compressor systems; describe the applications, installation considerations and advantages and disadvantages of each type.		
32.04 Identify packaged condensing units and unit coolers; describe their applications, operation and installation considerations.		
32.05 Identify two-stage compressors and explain their operation and applications.		
32.06 Identify the various accessories used in commercial refrigeration systems and explain why each is used and where it should be installed in the system.		
32.07 Identify the various refrigeration control devices and explain the purpose of each type and how it works.		
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.		

## **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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

SkillsUSA is the intercultural 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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly

indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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, 30, 31
Standard Length	4 Credits
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3011 - Architectural and Civil Drafters

**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 consisting of two occupational completion points. The four courses Drafting 1, 2, 3, 4, under the drafting program are considered core courses. 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.

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:

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

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

### Academic Alignment Tables

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science 1	Marine Science 1 Honors	Physical Science	Physics 1
8725010	2/87 2%	4/80 5%	25/83 30%	3/69 4%	26/67 39%	1/70 1%	4/69 6%	26/82 32%	4/66 6%	26/74 35%	4/72 6%
8725020	2/87 2%	3/80 4%	26/83 31%	3/69 4%	28/67 42%	2/70 3%	3/69 4%	27/82 33%	4/66 6%	27/74 36%	3/72 4%
8725030	22/87 25%	24/80 30%	2/83 2%	23/69 33%	4/67 6%	22/70 31%	22/69 32%	3/82 4%	25/66 38%	4/74 5%	23/72 32%
8725040	24/87 28%	24/80 30%	2/83 2%	24/69 35%	2/67 3%	22/70 31%	24/69 35%	2/82 2%	2/66 3%	2/74 3%	24/72 33%

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8725010	21/67 31%	9/75 12%	40/54 74%	14/46 30%	14/45 31%	#	#
8725020	19/67 28%	9/75 12%	37/54 69%	17/46 37%	17/45 38%	#	#
8725030	11/67 16%	18/75 24%	24/54 44%	#	#	9/45 20%	9/45 20%

8725040	11/67 16%	16/75 21%	21/54 39%	#	#	8/45 18%	8/45 18%
---------	--------------	--------------	--------------	---	---	-------------	-------------

# Alignment attempted, but no correlation to academic course

### **Florida Standards for Technical Subjects**

*Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education.*

**Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.**

### **Florida Standards for English Language Development (ELD)**

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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.

## **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 Design and prepare multi-view drawings.
- 03.0 Prepare sectional views.
- 04.0 Prepare auxiliary drawings.
- 05.0 Apply basic dimensioning.
- 06.0 Prepare pictorial drawings.
- 07.0 Prepare surface developments.
- 08.0 Design and prepare basic architectural drawings.
- 09.0 Perform basic computer aided drafting functions.
- 10.0 Prepare basic civil drawings.
- 11.0 Prepare computer aided drawings (CAD).
- 12.0 Research the history of the built environment.
- 13.0 Perform computer aided drafting functions.
- 14.0 Describe the importance of professional ethics and legal responsibilities in the design and construction industry.
- 15.0 Examine career opportunities in drafting and related fields to determine requisite skills, qualifications, supply and demand, market location and potential earnings
- 16.0 Apply three-dimensional modeling concepts.
- 17.0 Explain three-dimensional modeling.
- 18.0 Investigate sustainability issues related to the design, construction and maintenance of the built environment.

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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
01.0 Apply basic drafting skills--The student will be able to:		
01.01 Use and maintain drafting equipment, measuring scales, drafting instruments and reproduction equipment.	LAFS.910.L.3.6 LAFS.910.SL.2.5,6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,3	
01.02 Identify and use the various drafting media and techniques.	LAFS.910.L.3.6 LAFS.910.SL.2.5,6 LAFS.910.W.4.10	
01.03 Demonstrate the use of the alphabet of lines.	LAFS.910.L.3.6 LAFS.910.SL.2.5,6 LAFS.910.W.4.10	
01.04 Prepare title blocks and other drafting formats.	LAFS.910.SL.1.2 LAFS.910.SL.2.4,5 LAFS.910.W.4.10	
01.05 Use various freehand and other lettering techniques.	LAFS.910.L.3.6 LAFS.910.SL.2.4,5,6 LAFS.910.W.4.10	
01.06 Develop skill in sketching and mark making to plan, execute and construct two-dimensional images or three-dimensional models.	LAFS.910.SL.1.1 LAFS.910.W.4.10 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7,8 MAFS.912.G-GMD.2.4	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	MAFS.912.G-MG.1.1 MAFS.912.SRT.1.1	
01.07 Prepare presentation graphics.	LAFS.910.SL.2.4,5,6	
01.08 Apply geometric construction techniques.	LAFS.910.RI.1.1 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7,8 MAFS.912.G-GMD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.3.6 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.SRT.1.1	
01.09 Solve geometric, algebraic and trigonometric problems related to drafting.	LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.A-REI.1.1 MAFS.912.F-TF.1.3 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7,8 MAGS.912.G-SRT.2.5 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.3	
01.10 Demonstrate care of equipment.		
01.11 Apply use of effective and accurate architectural and/or engineering vocabulary throughout design and drafting process.	LAFS.910.L.3.6 LAFS.910.W.4.10	
02.0 Design and prepare multi-view drawings--The student will be able to:		
02.01 Analyze challenges and identify solutions for design problems.	LAFS.910.RI.1.1,3 LAFS.910.W.2.6 LAFS.910.W.3.7,8,9	
02.02 Investigate the use of space, scale and environmental features to create three-dimensional form, or the illusion of depth and form.	LAFS.910.W.2.6 LAFS.910.W.3.7,8,9 MAFS.912.G-SRT.1.1 MAFS.912.N-Q.1.2	
02.03 Prepare multi-view scaled drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
02.04 Select proper drawing scale, views and layout.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-SRT.1.1 MAFS.912.N-Q.1.1,2,3	
02.05 Prepare drawings containing horizontal and vertical surfaces.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
02.06 Prepare drawings containing circles and/or arcs.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-SRT.1.1,2	
02.07 Prepare removed details and conventional breaks.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
02.08 Prepare assembly drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
02.09 Prepare detail drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
02.10 Prepare technical drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
02.11 Modify drawings to include material specifications and parts list.	LAFS.910.L.3.6 LAFS.910.W.2.5,6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3	
03.0 Prepare sectional views--The student will be able to:	LAFS.910.W.2.6	
03.01 Prepare drawings containing full sections and half sections.	LAFS.910.L.3.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GMD.2.4 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
03.02 Prepare drawings containing offset sections.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GMD.2.4 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
03.03 Prepare drawings containing revolved sections.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G-CO.4.12,13 MAFS.912.G-GMD.2.4 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
03.04 Prepare drawings containing removed sections and broken-out sections.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.N-Q.1.1,2,3	
03.05 Prepare a sectional assembly drawing applying material symbols.	LAFS.910.L.3.6 LAFS.910.W.2.5,6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2 MAFS.912.G-GPE.2.6,7 MAFS.912.G-GMD.2.4 MAFS.912.G-MG.1.1 MAFS.912.N-Q.1.1,2,3	
<b>04.0 Prepare auxiliary drawings--The student will be able to:</b>		<b>SC.912.N.3.5</b>
04.01 Prepare drawings containing primary auxiliary views.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	CO.4.12,13 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.G-MG.1.1 MAFS.912.G-GMD.2.4 MAFS.912.N-Q.1.1,2,3	
04.02 Prepare drawings containing auxiliary views that include curved lines.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
05.0 Apply basic dimensioning--The student will be able to:		SC.912.N.3.5
05.01 Prepare drawings containing linear, angular and circular standard dimensions.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2	
05.02 Prepare drawings using general and local notes.	LAFS.910.L.3.6 LAFS.910.RI.1.1 LAFS.910.W.2.6 LAFS.910.W.4.10	
05.03 Apply basic tolerance techniques and nominal and actual dimensions.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3	



CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
05.04 Analyze and apply data and measurements to solve problems and interpret drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-MG.1.1,2,3	
06.0 Prepare pictorial drawings--The student will be able to:		SC.912.N.3.5
06.01 Prepare isometric, oblique and other pictorial drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-GPE.2.6,7 MAFS.912.G-MG.1.1	
06.02 Prepare one- and two-point perspectives.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
07.0 Prepare surface developments--The student will be able to:		SC.912.N.3.5
07.01 Prepare developments of prisms, cylinders, cones and pyramids.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-CO.4.12,13 MAFS.912.G-GMD.1.1 MAFS.912.G-MG.1.1	
07.02 Prepare developments of a transition piece.	LAFS.910.L.3.6 LAFS.910.W.2.6	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	LAFS.910.W.4.10 MAFS.912.G- CO.4.12,13 MAFS.912.G-GMD.1.1 MAFS.912.G-MG.1.1	
07.03 Prepare drawings involving intersecting pieces.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G- CO.4.12,13 MAFS.912.G-GMD.1.1 MAFS.912.G-MG.1.1	

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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
08.0 Design and prepare basic architectural drawings--The student will be able to:		SC.912.E.7.4,8; SC.912.L.17.16; SC.912.N.3.5; SC.912.P.10.4; SC.912.P.12.3
08.01 Solve design problems, through convergent and divergent thinking, to gain new perspectives.	LAFS.910.RI.1.1,3 LAFS.910.SL1.1,2,3 LAFS.910.W.3.7,8,9	
08.02 Apply critical thinking and problem solving skills to develop creative solutions for design problems.	LAFS.910.RI.1.1,3 LAFS.910.SL1.1,2,3 LAFS.910.W.3.7,8,9	
08.03 Draw site plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G-SRT.1.1,2	
08.04 Draw floor plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
08.05 Draw interior and exterior elevations.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
08.06 Draw roof plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
08.07 Prepare door/ window schedules.	MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
08.08 Draw wall sections.	LAFS.910.L.3.6 LAFS.910.SL.1.2 LAFS.910.SL.2.4,5,6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
08.09 Draw plot plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
08.10 Draw electrical plan.	LAFS.910.L.3.6 LAFS.910.SL.1.2 LAFS.910.SL.2.4,5,6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MD.2.4 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
08.11 Review and revise plans throughout the design process to refine and achieve design objective.	LAFS.910.W.3.7,8,9	
08.12 Demonstrate flexibility and adaptability throughout the design process.	LAFS.910.W.2.5,6,7,8,9	
08.13 Define a basic project materials list.		
08.14 Calculate a basic project quantity take-off.		
09.0 Perform basic computer aided drafting functions--The student will be able to:		
09.01 Demonstrate organizational skills to influence the sequential process when creating drawings.	LAFS.910.RI.1.1	
09.02 Construct geometric figures of lines, splines, circles and arcs.	LAFS.910.L.3.6 LAFS.910.W.2.5,6 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2	
09.03 Create and edit text using appropriate style and size to annotate drawings.	LAFS.910.L.3.6 LAFS.910.W.2.5,6	
09.04 Use control accuracy enhancement tools for entity positioning methods such as snap and XYZ.	LAFS.910.L.3.6 LAFS.910.W.2.6	
09.05 Use editing commands.	LAFS.910.L.3.6 LAFS.910.W.2.5,6	
09.06 Use viewing commands to perform zooming and panning.	LAFS.910.L.3.6 LAFS.910.W.2.6	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
09.07 Plot drawings on media using layout and scale.	LAFS.910.L.3.6 LAFS.910.W.2.6 MAFS.912.G-MG.1.3 MAFS.912.G-SRT.1.1	
09.08 Use query commands to interrogate database for entity characteristics, distance, area and status.	LAFS.910.L.3.6 LAFS.910.W.2.6	
09.09 Apply standard dimensioning rules.	LAFS.910.L.3.6 LAFS.910.W.2.6 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,3	
09.10 Move, stretch and offset objects.	LAFS.910.L.3.6 LAFS.910.W.2.6	
09.11 Create a radius between objects.	LAFS.910.L.3.6 LAFS.910.W.2.6 MAFS.912.G-C.1.2	
09.12 Trim and extend objects.	LAFS.910.L.3.6 LAFS.910.W.2.6	
09.13 Break and join objects.	LAFS.910.L.3.6 LAFS.910.W.2.6	
09.14 Create and edit dimensions.	LAFS.910.L.3.6 LAFS.910.W.2.5,6 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,3	
09.15 Change object properties.	LAFS.910.L.3.6 LAFS.910.W.2.5,6	
10.0 Demonstrate understanding of basic civil drawings--The student will be able to:		SC.912.E.6.4 SC.912.L.17.16 SC.912.N.3.5
10.01 Apply use of effective and accurate civil terminology throughout the design process.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10	
10.02 Read and interpret civil drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10	
10.03 Draw plan and profile drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.GMD.2.4 MAFS.912.G-MG.1.1	
10.04 Develop topographic drawings.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.0 Prepare computer aided drawings (CAD)--The student will be able to:		
11.01 Draw a floor plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.02 Draw a site plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1	



CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.03 Draw exterior and interior elevations.	LAFS.910.L.3.6 LAFS.910.SL.1.2 LAFS.910.SL.2.4,5,6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G- CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G- CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.04 Draw a roof plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G- CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G- CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.05 Prepare door and window schedules.	LAFS.910.L.3.6 LAFS.910.SL.1.2 LAFS.910.SL.2.4,5,6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G- CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.06 Draw a wall section.	LAFS.910.L.3.6 LAFS.910.SL.1.2 LAFS.910.SL.2.4,5 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G- CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G- CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.07 Draw an overall site plan.	LAFS.910.L.3.6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G- CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G- CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G- GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
11.08 Draw a building plot plan.		
11.09 Draw an electrical plan.	LAFS.910.L.3.6 LAFS.910.SL.1.2 LAFS.10.SL.2.4,5,6 LAFS.910.W.2.6 LAFS.910.W.4.10 MAFS.912.G-C.1.1,2,3,4	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
		MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
12.0	Research the history of the built environment.		
12.01	Describe the significance of major architects, engineers or inventors to understand their historical influences.	LAFS.910.RI.1.1,2,3 LAFS.910.RI.3.7 LAFS.910.SL.1.1,2,3	
12.02	Research innovative historical architectural and/or engineering works and examine the significance of their legacy for the future.	LAFS.910.RI.1.1,2,3 LAFS.910.RI.3.7 LAFS.910.SL.1.1,2,3	
12.03	Identify transitions in design media, technique and focus to explain how technology has changed design throughout history.	LAFS.910.RI.1.1,2,3 LAFS.910.RI.3.7 LAFS.910.SL.1.1,2,3	

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.

Abbreviations:

FS-M/LA = Florida Standards for Math/Language Arts  
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
13.0 Perform computer aided drafting functions--The student will be able to:		
13.01 Draw lines, arcs, circles, etc. to represent plans and/or mechanical assemblies.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4 MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
13.02 Create text styles, text justification and multi-line text.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.03 Create and use multi-leaders.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.04 Edit dimensions.	LAFS.1112.L.3.6 LAFS.1112.W.2.5,6 LAFS.1112.W.4.10 MAFS.912.G-C.1.1,2,3,4	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
	MAFS.912.G-CO.1.1,2,3,4,5 MAFS.912.G-CO.2.6,7 MAFS.912.G-CO.4.12,13 MAFS.912.G-MG.1.1 MAFS.912.G-GPE.2.5,6,7 MAFS.912.G-SRT.1.1,2 MAFS.912.N-Q.1.1,2,3	
13.05 Work with dimension styles.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.06 Crosshatch objects.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.07 Apply external references.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.08 Isolate and hide objects.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.09 Use selection set methods.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.10 Use rectangular and polar arrays.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.11 Use rotation reference angles.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-CO.1.5 MAFS.912.F-TF.1.1	
13.12 Use elements of creativity and organizational principles to create visually coherent viewports and layouts.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 MAFS.912.G-CO.4.12 MAFS.912.G-SRT.1.1	
13.13 Create and manage layers.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
13.14 Use page setup for plotting.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-SRT.1.1	
13.15 Create, insert and edit reusable content such as symbols and blocks.	LAFS.1112.L.3.6 LAFS.1112.W.2.5,6 LAFS.1112.W.4.10	
13.16 Use specific line types.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.17 Create fills and gradients.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
13.18 Edit hatch patterns and fills.	LAFS.1112.L.3.6 LAFS.1112.W.2.5,6 LAFS.1112.W.4.10	
14.0 Describe the importance of professional ethics and legal responsibilities in the design and construction industry--The student will be able to:		SC.912.E.7.8; SC.912.L.17.13; SC.912.N.4.1, 2
14.01 Evaluate and justify decisions based on ethical reasoning.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.8	
14.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities and employer policies.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.8	
14.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.8	
14.04 Interpret and explain written organizational policies and procedures.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.8	
14.05 Demonstrate personal responsibility, ethics and integrity, including respect for intellectual property, when accessing information and creating design projects.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.8	
15.0 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:		
15.01 Identify and demonstrate positive work behaviors needed to be employable.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.7,8	
15.02 Develop and use criteria to select works for a digital career portfolio.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.7,8	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
15.03 Evaluate and compare employment opportunities that match career goals.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.7,8	
15.04 Examine licensing, certification, education and industry credentialing requirements for careers in design and construction industry.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.7,8	
15.05 Identify opportunities and research requirements for career advancement.	LAFS.1112.RI.3.8 LAFS.1112.W.1.1 LAFS.1112.W.3.7,8	

**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
16.0 Apply three-dimensional modeling concepts--The student will be able to:		
16.01 Use coordinate systems to locate objects in three dimensional space.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.N-Q.1.1,2,3 MAFS.912.N-VM.1.1 MAFS.912.N-VM.2.4,5	
16.02 Use basic geometric shapes available in two-dimensional and three-dimensional modeling software.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2	
16.03 Define the parameters used for determining size, placement and orientation of a modeling object.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-CO.4.12,13 MAFS.912.G-SRT.1.1,2	
16.04 Describe the Boolean modeling operations of union, subtraction and intersection.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10 MAFS.912.G-GMD.1.1 MAFS.912.N-Q.1.1,2,3	



<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSS-Sci</b>
16.05	Demonstrate extrusion or sweeping techniques that transform two-dimensional objects into three-dimensional objects.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.06	Describe the 'revolve' or 'lathe' techniques for animating a two-dimensional object and give examples of their application.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.07	Use scale, rotate and move actions that comprise the transformation technique for animating a three-dimensional object.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.08	Use basic viewing navigation tools such as zoom, rotate and panning.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.09	Work with materials, techniques and processes through practice and perseverance to create desired result in two-dimensional and three-dimensional models.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.10	Analyze challenges and identify solutions for three-dimensional design problems.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.11	Investigate the use of space, scale and environmental features within a model to create three-dimensional form or the illusion of depth and form.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.12	Apply materials, ideas, images and/or equipment from other content areas to generate ideas and processes for the development of three-dimensional models.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
16.13	Investigate the use of various technology, software and media design to reflect creative trends in visual culture.	LAFS.1112.L.3.6 LAFS.1112.W.2.6 LAFS.1112.W.4.10	
17.0	Explain three-dimensional modeling--The students will be able to:		
17.01	Define three-dimensional modeling.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8 MAFS.912.CO.1.1,2,3,4,5 MAFS.912.CO.2.6,7,8	
17.02	Describe the polygonal, non-uniform rational b-spline (NURBS), splines and patches and primitives of three-dimensional modeling.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8 MAFS.912.CO.1.1,2,3,4,5 MAFS.912.CO.2.6,7,8	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
17.03 Describe the constructive solid geometry method of three-dimensional modeling.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8 MAFS.912.CO.1.1,2,3,4,5 MAFS.912.CO.2.6,7,8	
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.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	
18.02 Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	
18.03 Research and recommend sustainable design solutions.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	
18.04 Identify specific design practices that can lessen adverse impacts on the environment.	LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	
18.05 Explain the environmentally sustainable features of a building.	LAFS.1112.RI.3.8 LAFS.1112.SL.1.2 LAFS.1112.SL.2.4,5,6 LAFS.1112.W.2.6 LAFS.1112.W.3.7,8	

## **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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

### **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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different

competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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	0646030202
Grade Level	9-12, 30, 31
Standard Length	8 Credits
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-3013 - Helpers--Electricians 47-2111 - Electricians

**Purpose**

The purpose of this program is to prepare students for employment or advanced training in a variety of construction electrical 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. The following table illustrates the secondary program structure:

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:

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

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

### Academic Alignment Tables

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth- Space Science	Environmental Science	Genetics	Integrated Science 1	Marine Science 1 Honors	Physical Science	Physics 1
8727210	#	9/80 11%	22/83 27%	6/69 9%	26/67 39%	8/70 11%	1/69 1%	26/82 32%	5/66 8%	31/74 42%	20/72 28%
8727220	#	1/80 1%	24/83 29%	#	21/67 31%	7/70 10%	1/69 1%	22/82 27%	4/66 6%	22/74 30%	2/72 3%
8727230	19/87 22%	19/80 24%	#	19/69 28%	#	19/70 27%	19/69 28%	#	14/66 21%	#	19/72 26%
8727240	1/87 1%	1/80 1%	1/83 1%	1/69 1%	1/67 1%	1/70 1%	1/69 1%	1/82 1%	1/66 2%	3/74 4%	3/72 4%
8727250	1/87 1%	1/80 1%	1/83 1%	1/69 1%	1/67 1%	1/70 1%	1/69 1%	1/82 1%	1/66 2%	1/74 1%	1/72 1%
8727260	1/87 1%	1/80 1%	1/83 1%	1/69 1%	1/67 1%	1/70 1%	1/69 1%	1/82 1%	1/66 2%	1/74 1%	1/72 1%

8727270	1/87 1%	1/80 1%	2/83 2%	1/69 1%	2/67 3%	1/70 1%	1/69 1%	2/82 2%	1/66 2%	2/74 3%	1/72 1%
8727280	1/87 1%	1/80 1%	#	1/69 1%	#	1/70 1%	1/69 1%	#	1/66 2%	#	#

# Alignment attempted, but no correlation to academic course

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8727210	2/67 3%	2/75 3%	#	5/46 11%	5/45 11%	#	#
8727220	16/67 24%	9/75 12%	15/54 28%	2/46 4%	2/45 4%	2/45 4%	2/45 4%
8727230	9/67 13%	15/75 20%	8/54 15%	#	#	#	#
8727240	8/67 12%	8/75 11%	8/54 15%	#	#	3/45 7%	3/45 7%
8727250	#	#	#	#	#	1/45 2%	1/45 2%
8727260	#	#	#	#	#	#	#
8727270	1/67 1%	#	1/54 2%	#	#	3/45 7%	3/45 7%
8727280	#	1/75 1%	#	0/46 0%	0/45 0%	1/45 2%	1/45 2%

# Alignment attempted, but no correlation to academic course

### **Florida Standards for Technical Subjects**

*Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education.*

**Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.**

### **Florida Standards for English Language Development (ELD)**

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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.



## **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 science knowledge and skills related to electrical principles.
- 10.0 Demonstrate proficiency in electrical math problems and skills.
- 11.0 Demonstrate 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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
01.0 Explain the importance of health, safety, environmental stewardship and related regulatory compliance--The student will be able to:		SC.912.L.17.8 SC.912.P.10.2
01.01 Clean the work area and maintain it in a safe condition.		
01.02 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.	LAFS.910.SL.2.4 LAFS.910.W.2.4	
01.03 Identify and operate workplace-safety electrical devices.		
01.04 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.		
01.05 Explain emergency procedures to follow in response to workplace accidents.	LAFS.910.RI.1.3 LAFS.910.W.2.4 LAFS.910.SL.2.4	
01.06 Create a disaster and/or emergency response plan for specific incidences.	LAFS.910.W.2.4	
01.07 Explain the importance of CPR (cardiopulmonary resuscitation) and first aid.	LAFS.910.RI.1.3 LAFS.910.W.2.4 LAFS.910.SL.2.4	
01.08 Describe "Right-to-Know" Law as recorded in (29 CFR.1910.1200).	LAFS.910.SL.2.4 LAFS.910.W.2.4	
02.0 Identify, use and maintain the tools and accessories used in the electrical industry--The student will be able to:		SC.912.P.10.1,2,3,1 2, 21

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
02.01 Identify and select tools, equipment, materials and wires to complete a job.		
02.02 Drill holes in metal, wood and concrete for electrical wiring.		
02.03 Lay out electrical devices, complying with regulations.		
02.04 Install the following, complying with the appropriate local, state or national electric codes: a. Conductors and cable b. Standard outlets and switch boxes c. Cord connections on equipment d. 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:		SC.912.P.8.3 SC.912.P.10.4,5,10, 13,15,18 SC.912.P.12.5,9
03.01 Define the following terms: voltage, current, resistance and power.	LAFS.910.RI.2.4	
03.02 Measure voltage, amperage and resistance using industry standard electrical measuring devices.		
03.03 Analyze and explain a series, series-parallel and parallel circuit.	LAFS.910.RI.1.3 LAFS.910.W.2.4 LAFS.910.SL.2.4	
03.04 Draw each type of circuit and calculate the circuit values.		
03.05 Explain and apply Ohm's Law.	MAFS.912.A-CED.1.4 LAFS.910.SL.2.4	
03.06 Compute conductance and resistance of conductors and insulators.	MAFS.912.A-CED.1.4	
04.0 Apply mathematics knowledge and skills to electricity--The student will be able to:		SC.912.P.10.1,2,20 SC.912.P.12.1,2,5,9
04.01 Demonstrate knowledge of arithmetic operations.		
04.02 Analyze and apply data and measurements to solve problems and interpret documents.	MAFS.912.A-CED.1.4	
04.03 Construct charts/tables/graphs using functions and data.	MAFS.912.A-CED.1.2	
05.0 Demonstrate an understanding of basic electricity--The student will be able to:		SC.912.E.5.2,6 SC.912.L.17.10,11, 13,15,19 SC.912.P.8.1,3 SC.912.P.10.18,21 SC.912.P.12.5,7,9

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
05.01 Explain the principles of electromagnetism.	LAFS.910.RI.1.3 LAFS.910.W.2.4 LAFS.910.SL.2.4	
05.02 Explain the magnetic properties of circuits and devices.	LAFS.910.RI.1.3 LAFS.910.W.2.4 LAFS.910.SL.2.4	
05.03 Relate electricity to the nature of matter.		
05.04 Describe various ways that electricity is produced.	LAFS.910.SL.2.4 LAFS.910.W.2.4	
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.	LAFS.910.SL.2.4 LAFS.910.W.2.4	
06.02 Read and interpret basic electric codes, wiring plans and specifications.	LA.910.RI.1.3	
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.	LAFS.910.W.2.4	

**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 and science applications in electricity.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
07.0 Apply further mathematics knowledge and skills to electricity--The student will be able to:		SC.912.P.10.26
07.01 Demonstrate and solve basic algebraic formulas related to electricity.	MAFS.912.A-CED.1.4	
07.02 Solve basic trigonometric functions related to electrical theory.		
07.03 Explain basic AC theory and solve related mathematical problems using appropriate test equipment.	MAFS.912.A-CED.1.4	
07.04 Solve math-related problems from measurements on training aids. (Optional)	MAFS.912.A-CED.1.4	
08.0 Demonstrate further understanding of electricity--The student will be able to:		SC.912.P.10.3,4
08.01 Explain molecular action as a result of temperature extremes, chemical reaction and moisture content.		
08.02 Explain how voltage is produced by chemical, mechanical, thermal, photoelectric and piezo electric means.	LAFS.910.W.2.4 LAFS.910.SL.1.1	
08.03 Identify electrical symbols in construction documents.		
09.0 Demonstrate science knowledge and skills related to electrical principles--The student will be able to:		SC.912.L.17.8,10,11, 13,15,17,19,20
09.01 Discuss the role of creativity in constructing scientific questions, methods and explanations.	LAFS.910.SL.1.1	
09.02 Formulate scientifically investigable questions, construct investigations, collect and evaluate data and develop scientific recommendations based on findings.	LAFS.910.W.2.4	

**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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts

NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
10.0 Demonstrate proficiency in electrical math problems and skills--The student will be able to:		
10.01 Calculate wiring costs.		
10.02 Describe the use of high-voltage test equipment.		
10.03 Describe how to test insulation.		
10.04 Describe how to balance a load.		
10.05 Use electrical related math skills.	MAFS.912.A-CED.1.4	

**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 electrical math, alternating-current circuit and troubleshooting residential electric circuits.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
11.0	Demonstrate Alternating-Current (AC) circuit skills--The student will be able to:		
11.01	Identify the physical and electrical characteristics of capacitors and inductors.		SC.912.P.10.14
11.02	Demonstrate proficiency in measuring, testing and connecting a transformer.		SC.912.P.10.15 SC.912.N.1.1
11.03	Apply the principles of transformers to AC circuits.		SC.912.P.10.15 SC.912.N.1.1
11.04	Identify the properties of an AC signal.		
11.05	Identify AC sources.		SC.912.P.10.16
11.06	Analyze and apply the principles of transformers to AC circuits.		SC.912.N.1.1
11.07	Analyze poly-phase circuits.		SC.912.N.1.1
11.08	Install a simple poly-phase circuit.		
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.		



CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
12.03 Examine licensing, certification and industry credentialing requirements.		
12.04 Maintain a career portfolio to document knowledge, skills and experience.	LAFS.1112.W.1.2 a, b, c, d, f	
12.05 Evaluate and compare employment opportunities that match career goals.		
12.06 Identify and exhibit traits for retaining employment.	LAFS.1112.W.3.9 b LAFS.1112.W.3.8	
12.07 Identify opportunities and research requirements for career advancement.		
12.08 Research the benefits of ongoing professional development.	LAFS.1112.W.3.9 b LAFS.1112.W.3.8	
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 competencies in the installation of residential wiring.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts

NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
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 Draw a residential wiring plan, using electrical-wiring symbols.	LAFS.1112.RI.1.1	
13.03 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 or national electric codes.		SC.912.N.1.1
13.04 Identify, install and wire a duplex- receptacle-outlet circuit, a split-circuit duplex- receptacle-outlet circuit and a special-purpose receptacle-outlet circuit according to the specifications, complying with the appropriate local, state or national electric codes.		SC.912.N.1.1

**Florida Department of Education  
Student Performance Standards**

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

**Course Description:**

This course provides students with an in-depth knowledge of the installation of residential wiring.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
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 equipment.		
14.04 Install the following, complying with the appropriate local, state or national electric codes: a. Service-entrance main panel b. Service-entrance meter base c. Alarm system/smoke detectors		SC.912.N.1.1
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.		SC.912.N.1.1

**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 installation.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts

NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
15.0 Demonstrate proficiency in commercial wiring--The student will be able to:		
15.01 Read and interpret a commercial wiring plan and specifications.	LAFS.1112.RI.1.1	
15.02 Draw a commercial electrical-wiring plan.	LAFS.1112.L.3.6	
15.03 Select tools, equipment, materials and wires to complete a job.		SC.912.N.1.1
15.04 Install the following according to the plan and specifications, complying with appropriate electric codes: 15.04.1 Wire mold 15.04.2 Conduit, duct and raceway systems 15.04.3 Conductors in a conduit		SC.912.N.1.1
15.05 Describe the difference between a residential and a commercial lighting circuit.	LAFS.1112.SL.2.4	
15.06 Construct control circuits from schematics.		SC.912.N.1.1
15.07 Describe high-voltage (over 600V) wiring requirements.	LAFS.1112.SL.2.4	

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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts

NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
16.0 Demonstrate specialized electrical skills--The student will be able to:		
16.01 Explain solid-state control devices.	LAFS.1112.SL.2.4	
16.02 Explain data cable installation according to the plan and specifications.	LAFS.1112.SL.2.4	

## **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.

### **Special Notes**

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the postsecondary program with the same Classification of Instructional Programs (CIP) number.

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

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

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, 30, 31
Standard Length	4 Credits
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3031 - Surveying and Mapping Technicians

**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 consisting of one occupational completion point.

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:

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

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics, VO= Career and Technical Education)

### Academic Alignment Tables

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8915010	**	**	**	**	**	**	**	**	**	**	**
8915020	**	**	**	**	**	**	**	**	**	**	**
8915030	**	**	**	**	**	**	**	**	**	**	**
8915040	**	**	**	**	**	**	**	**	**	**	**

\*\* Alignment pending review

# Alignment attempted, but no correlation to academic course

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8915010	**	**	**	**	**	**	**
8915020	**	**	**	**	**	**	**
8915030	**	**	**	**	**	**	**
8915040	**	**	**	**	**	**	**

\*\* Alignment pending review

# Alignment attempted, but no correlation to academic course

### Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and

*language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education.*

**Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.**

**Florida Standards for English Language Development (ELD)**

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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.

## **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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		
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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>	<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		
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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		
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.

**Abbreviations:**

FS-M/LA = Florida Standards for Math/Language Arts  
 NGSSS-Sci = Next Generation Sunshine State Standards for Science

*Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.*

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		

<b>CTE Standards and Benchmarks</b>		<b>FS-M/LA</b>	<b>NGSSS-Sci</b>
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.		
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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

### **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 Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly

indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education  
Curriculum Framework

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

**PSAV**

Program Number	C100100
CIP Number	0646041506
Grade Level	30, 31
Standard Length	900 Hours
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9071 - Maintenance and Repair Workers, General
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 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	SOC Code
A	BCV 0080	Building Construction Assistant	BLDG CONST @7 7G CARPENTRY @7 7G TECH ED 1@2 BLDG MAINT @7 7G	450 Hours	49-9071
B	BCV 0081	Carpentry and Masonry Technician	TEC CONSTR @7 7G TEC DRAFT 7G DRAFTING @7 7G ENG 7G	150 Hours	49-9071
C	BCV 0082	Electrical and Plumbing Technician	AC HEAT MC @7 7G ELECTRICAL @7 7G PLUMBIN @7 7G TROWEL TR 7G	150 Hours	49-9071
D	BCV 0083	Building Maintenance Technician (formerly 'A/C and Painting Technician')	SHEETMETAL @7 7G ROOFING 7G WOODWORKIN @4	150 Hours	49-9071



## **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 Research, 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 rough and finish carpentry skills.
- 08.0 Demonstrate masonry skills.
- 09.0 Demonstrate painting and decorating skills.
- 10.0 Demonstrate 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 and how they apply to the construction process
- 16.0 Demonstrate electrical rough in skills.
- 17.0 Demonstrate finish electrical skills.
- 18.0 Demonstrate plumbing rough in skills.
- 19.0 Demonstrate finish plumbing skills.
- 20.0 Demonstrate heating, ventilation and air conditioning (HVAC) rough in skills.
- 21.0 Demonstrate finish heating, ventilation and air conditioning (HVAC) skills.
- 22.0 Demonstrate design technology.

Florida Department of Education  
Student Performance Standards

Program Title: Building Trades and Construction Design Technology  
PSAV Number: C100100

<b>Course Number: BCV 0080</b>	
<b>Occupational Completion Point: A</b>	
<b>Building Construction Assistant – 450 Hours – SOC Code 49-9071</b>	
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 (formerly known as Material Safety Data Sheets (MSDS)) and follow the procedures as necessary.
01.03	Discuss and analyze and discuss the “Right-to-Know” Law as recorded in (29 CFR-1910.1200).
01.04	Identify and demonstrate the use of safety equipment such as fall arrest systems, fire extinguishers, scaffolds and ladders.
01.05	Identify and interpret follow disaster plans.
01.06	Describe and demonstrate appropriate safety attitudes and behaviors in the shop and on the job in construction industry.
01.07	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.
01.08	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.09	Explain and demonstrate emergency procedures to follow in response to workplace accidents.
01.10	Create a disaster and/or emergency response plan.
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	Research, identify, classify and present construction components, materials, hardware and characteristics--The student will be able to:

04.01	Research, identify and present the various components, materials and hardware used in residential construction applications.
04.02	Research, identify and present the various components, materials and hardware used in commercial construction applications.
04.03	Research, identify and present the various components, materials and hardware used in industrial construction applications.
04.04	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.
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 the relationship between the Department of Labor and the construction industry, economy and 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	Research 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 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 cold-formed steel framing.
07.19	Calculate, layout and install suspended ceilings.
08.0	Demonstrate 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.
09.0	Demonstrate 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 science knowledge and skills--The students will be able to:

10.01	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.
10.02	Discuss the role of creativity in constructing scientific questions, methods and explanations.
10.03	Formulate scientifically investigable questions, construct investigations, collect and evaluate data and develop scientific recommendations based on findings.
10.04	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.)
10.05	Explain pressure measurement in terms of PSI and inches of mercury.
10.06	Explore new technology as it applies to the construction industry in terms of materials, processes and the need for continuing education.
10.07	Compare and analyze traditional and digital media to learn how technology has altered opportunities for innovative responses and results.
10.08	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 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).
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	Research 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 architectural designs and/or models to understand how technical and utilitarian components impact aesthetic qualities.
12.05	Analyze changes in architectural styles and construction practices over time relative to various environments.
12.06	Describe the significance of major architects, engineers or inventors to understand their historical influences.
12.07	Research innovative historical architectural and/or engineering works and examine the significance of their legacy for the future.
12.08	Identify transitions in design media, technique and focus to explain how technology has changed design 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	Research sustainable building design and its relationship between health, energy efficiency and money savings for government, businesses and individuals.
13.06	Research the effects of building science on construction and energy efficiency.
13.07	Research renewable fuels and energy.

**Course Number: BCV 0081**  
**Occupational Completion Point: B**  
**Carpentry and Masonry Technician – 150 Hours – SOC Code 49-9071**

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 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 and schedules), 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 the basic use of computer-aided design software.
15.08	Demonstrate 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 – SOC Code 49-9071**

16.0 Demonstrate 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 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).

16.03 Design and calculate electrical loads using ohms law to determine power, American wire gauge (AWG) and electrical equipment sizes.

16.04 Apply basic electrical theory to wiring a project.

16.05 Design and install a branch circuit system in a project.

16.06 Explain grounding, its purpose and relation to electrical safety.

16.07 Install Ground Fault Circuit Interrupter (GFCI) circuitry.

16.08 Troubleshoot electrical systems, using testing and metering devices.

16.09 Install a meter, distribution panel and breaker panel for a project.

16.10 Identify types of wiring raceways (EMT / IMC / PVC / MC Cable / Romex / SE Cable / UF Cable).

16.11 Install conduit, pipe, shielded electrical cable and electrical boxes in a project.

17.0 Demonstrate finish electrical skills--The student will be able to:

17.01 Install electrical components relating to residential & commercial applications.

17.02 Wire an air-conditioning system, heat exchanger, heat pump or electric water heater into an electrical supply and properly size wire and overcurrent protection.

17.03 Troubleshoot and inspect electrical systems.

18.0 Demonstrate 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 system for a project.

18.03	Lay out and install a drain-waste-and-vent system for a project.
18.04	Test and inspect plumbing systems.
18.05	Design, layout and install a domestic solar hot water system.
19.0	Demonstrate 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 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 heating, ventilation and air-conditioning (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 Heating, Ventilation and Air-Conditioning (HVAC) control systems and air-quality management.

**Course Number: BCV 0083**

**Occupational Completion Point: D**

**Building Maintenance Technician (formerly 'A/C and Painting Technician') – 150 Hours – SOC Code 49-9071**

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, through convergent and divergent thinking, 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 critical thinking skills for various contexts to develop, refine and reflect on a design theme.

22.04 Use and maintain tools and equipment to facilitate design and construction process.
22.05 Work in a project team to show creative cohesiveness, team building, respectful compromise and time-management skills.
22.06 Apply carpentry skills.
22.07 Apply masonry skills.
22.08 Apply mechanical, electrical and plumbing (MEP) skills.
22.09 Apply construction industry safety.
22.10 Apply sustainable construction practices.
22.11 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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

### **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 (if applicable)**

In PSAV 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: Mathematics 9, Language 9, and Reading 9. 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(7), 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(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

## **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 PSAV  
**Program Type:** Career Preparatory  
**Career Cluster:** Architecture and Construction

**PSAV**

Program Number	C100200
CIP Number	0615130100
Grade Level	30,31
Standard Length	1500 Hours
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3011 - Architectural and Civil Drafters; 17-3013 - Mechanical Drafters, 17-3019 – Drafters, All Other
Basic Skills Level	Mathematics: 10 Language: 9 Reading: 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	SOC Code
A	TDR0070	Introduction to Drafting (formerly 'Blueprint Reader')	BLDG CONSTR @7 7G DRAFTING @7 7G TEC DRAFT 7G TEC CONSTR @7 7G	150 Hours	17-3011
B	TDR0370	Drafting Assistant		450 Hours	17-3011
C	TDR0775	Drafting Detailer 1		150 Hours	17-3011
	TDR0776	Drafting Detailer 2		150 Hours	
D	TDR0570	Architectural Drafter		150 Hours	17-3011
E	TDR0874	Civil Drafter		150 Hours	17-3011
F	TDR0777	Mechanical Drafter		150 Hours	17-3013
G	TDR0875	Structural Drafter	150 Hours	17-3019	



## **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 functions.
- 10.0 Prepare physical 3-D model from a 2-D drawing.
- 11.0 Prepare basic architectural drawings.
- 12.0 Demonstrate geometry 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 understanding of basic civil drawings.
- 16.0 Demonstrate basic electrical/electronic literacy.
- 17.0 Perform advanced computer aided drafting 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 plot plan drawing.
- 23.0 Prepare a basic landscape plan drawing.
- 24.0 Convert basic architectural 3-D model to a mechanically created prototype.
- 25.0 Prepare advanced computer aided mechanical working drawings.
- 26.0 Convert computer aided 3-D model to a rapid prototype of a mechanical device.
- 27.0 Prepare 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 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.
- 35.0 Prepare presentation drawings.
- 36.0 Integrate drawing sets.
- 37.0 Convert computer aided 3-D or building information models to rapid prototypes of 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 three-dimensional computer aided drawings.

Florida Department of Education  
Student Performance Standards

Program Title: Drafting PSAV  
PSAV Number: C100200

<b>Course Number: TDR0070</b>	
<b>Occupational Completion Point: A</b>	
<b>Introduction to Drafting (formerly 'Blueprint Reader') – 150 Hours – SOC Code 17-3011</b>	
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/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 drawing(s) containing full section(s) and half section(s).
04.02	Prepare drawing(s) containing offset section(s).
04.03	Prepare drawing(s) containing revolved section(s).
04.04	Prepare drawing(s) containing removed section(s) and broken-out section(s).
04.05	Prepare a sectional assembly drawing applying material symbols.
05.0	Prepare auxiliary drawings--The student will be able to:
05.01	Prepare drawing(s) containing primary auxiliary views.
05.02	Prepare drawing(s) 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 drawing(s) 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- 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 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 layer, color and line 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 3-D model from a 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 – SOC Code 17-3011**

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 plot plan and/or site plan.

11.04	Prepare floor plan.
11.05	Prepare roof plan.
11.06	Prepare exterior elevations.
11.07	Prepare typical wall section.
12.0	Demonstrate geometry 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.
12.03	Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
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 tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
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 understanding of basic civil drawings--The student will be able to:
15.01	Understand civil terminology.
15.02	Read and interpret civil drawings.
15.03	Prepare 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 computer aided drafting 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 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-Know Law" as recorded in (29 CFR-1910.1200).

**Course Number: TDR0775**  
**Occupational Completion Point:**  
**Drafting Detailer 1 – 150 Hours – SOC Code 17-3011**

20.0	Prepare computer aided 3-D architectural drawings--The student will be able to:
20.01	Draw 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 first floor plan.
21.02	Prepare second floor plan.
21.03	Prepare basic roof framing layout drawing.
21.04	Prepare two-story elevation drawing.
21.05	Prepare second floor framing plan.
21.06	Create stair drawings and details.
22.0	Prepare a basic plot plan drawing--The student will be able to:
22.01	Layout a residential plot.
22.02	Indicate plot size, orientation and limits.
22.03	Layout a public street, sidewalk and public utility lines.
22.04	Write a plot legal description.
22.05	Dimension building location.
22.06	Layout and label specialty features (patio/ pool/ gazebo).
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/shrubs.
23.03	Develop a list of landscape symbols.
24.0	Convert 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 dimensions to 3-D print a basic prototype.
24.02	Use a digital 3-D model design containing circular dimensions to 3-D print a basic prototype.

**Course Number: TDR0776**  
**Occupational Completion Point: C**  
**Drafting Detailer 2 – 150 Hours – SOC Code 17-3011**

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 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 dimensions 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 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 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 Apply electrical symbols legend to 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 HVAC symbols legend for 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 plumbing symbols legend for plumbing plan.

32.0	Prepare 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 dimensions.
32.02	Create a digital scale 3-D model from a 2-D design containing circular dimensions.

**Course Number: TDR0570**  
**Occupational Completion Point: D**  
**Architectural Drafter – 150 Hours – SOC Code 17-3011**

33.0	Prepare architectural drawings for a commercial building--The student will be able to:
33.01	Interpret catalogs, specifications, technical tables, codes and ordinances for commercial buildings.
33.02	Prepare a commercial site plan.
33.03	Prepare floor plan, with dimensions for a commercial building.
33.04	Prepare foundation plan with dimensions and footing schedule for a commercial building.
33.05	Prepare roof plan for a commercial building to include drainage plan and roof framing plan.
33.06	Prepare elevation drawings for a commercial building.
33.07	Prepare building section for a commercial building.
33.08	Prepare door and window schedules for a commercial building.
34.0	Prepare basic building utility drawings--The student will be able to:
34.01	Prepare an electrical plan for a commercial building.
34.02	Prepare riser diagram(s).
34.03	Prepare a plumbing plan for a commercial building.
34.04	Prepare heating, ventilation and air-conditioning (HVAC) plan for a commercial building.
35.0	Prepare presentation drawings--The student will be able to:
35.01	Produce color pictorial drawings for a commercial building.
35.02	Prepare a dynamic presentation zoom views or 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 building design or building components--The student will be able to:
37.01	Use a digital 3-D model containing 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	Prepare schedules for architectural project tasks.
38.02	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 – SOC Code 17-3011**

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 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 traverse drawing(s).

41.02	Prepare street layout drawing(s).
41.03	Prepare advanced map drawing(s).
41.04	Prepare highway drawing(s).
41.05	Prepare topographic drawing(s).
42.0	Prepare advanced civil drawings--The student will be able to:
42.01	Prepare drainage drawing.
42.02	Prepare plat drawing.
42.03	Prepare advanced plan and profile drawing.
42.04	Prepare 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 – SOC Code 17-3013**

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 drawing(s).
44.05	Prepare fastener drawing(s).
44.06	Prepare cam drawing with dimensions.
44.07	Prepare gear drawing with dimensions.

44.08	Prepare spring drawing with dimensions.
45.0	Prepare production drawings using 3-D CAD techniques--The student will be able to:
45.01	Make pattern shop detail drawing(s).
45.02	Make casting drawing.
45.03	Make forging detail drawing.
45.04	Make machining detail drawing.
45.05	Make 3D stamping drawing.
45.06	Make 3D welding drawing.
45.07	Prepare 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 piping drawing.
46.02	Prepare pictorial piping drawing.
46.03	Prepare sectional drawing.
46.04	Prepare diagram.
47.0	Prepare tool drawings using 3-D CAD techniques--The student will be able to:
47.01	Prepare 3D jig and fixture drawing.
47.02	Prepare 3D cutting die drawing.
47.03	Prepare 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 – SOC Code 17-3019**

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 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 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 three-dimensional computer aided drawings--The student will be able to:

53.01 Produce structural 3D (steel, wood and reinforced concrete) 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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

### **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 (if applicable)**

In PSAV 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: Mathematics 10, Language 9, and Reading 9. 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(7), 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(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

## **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:** Air-Conditioning, Refrigeration and Heating Technology 1  
**Program Type:** Career Preparatory  
**Career Cluster:** Architecture and Construction

**PSAV**

Program Number	C400100
CIP Number	0647020107
Grade Level	30, 31
Standard Length	750 Hours
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9021 - Heating, Air Conditioning, and Refrigeration Mechanics and Installers
Basic Skills Level	Mathematics: 10 Language: 9 Reading: 9

**Purpose**

The purpose of this program is to prepare students for employment or advanced training in the heating, air-conditioning, and refrigeration and ventilation 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	SOC Code
A	ACR0041	Air Conditioning, Refrigeration and Heating Helper	AC HEAT ME @7 G REFRG MECH 7 G	250 Hours	49-9021
B	ACR0043	Air Conditioning, Refrigeration and Heating Mechanic Assistant		250 Hours	49-9021
C	ACR0047	Air Conditioning, Refrigeration and Heating Mechanic 1		250 Hours	49-9021

## **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 Identify, use and maintain the tools and tool accessories used in the heating, air-conditioning and refrigeration industry.
- 03.0 Demonstrate mathematics knowledge and skills.
- 04.0 Demonstrate a practical knowledge of basic electricity and of the electrical components of heating, air-conditioning and refrigeration equipment.
- 05.0 Troubleshoot heating, air-conditioning and refrigeration electrical control systems and their components.
- 06.0 Select and test electrical generation and distribution components for commercial heating and air conditioning systems.
- 07.0 Maintain, test and troubleshoot electrical motors and their components for commercial heating and air-conditioning systems.
- 08.0 Troubleshoot and wire electrical motors and their components.
- 09.0 Operate solid-state electronics as used in heating, air-conditioning and refrigeration systems.
- 10.0 Evaluate single-phase and three-phase power as used in heating, air-conditioning and refrigeration systems.
- 11.0 Explain the function of basic electronics.
- 12.0 Describe the history and concepts of heating, air-conditioning and refrigeration.
- 13.0 Explain the properties of matter and heat behavior.
- 14.0 Analyze fluids, pressures, refrigerants and related codes.
- 15.0 Evaluate heating, air-conditioning and refrigeration system components and accessories.
- 16.0 Select appropriate commercial compressors.
- 17.0 Test and adjust commercial evaporative condensers.
- 18.0 Maintain, test and troubleshoot commercial evaporators.
- 19.0 Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
- 20.0 Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing.
- 21.0 Utilize and operate mechanical refrigeration servicing and testing equipment.
- 22.0 Assist in the installation of a residential heating and air-conditioning system and determine start-up procedures.
- 23.0 Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems.
- 24.0 Demonstrate a working knowledge of refrigerants and oils.
- 25.0 Conduct system startup and shutdown.
- 26.0 Explain the importance of employability and entrepreneurship skills.

Florida Department of Education  
Student Performance Standards

Program Title: Air-Conditioning, Refrigeration and Heating Technology 1  
PSAV Number: C400100

<b>Course Number: ACR0041</b>	
<b>Occupational Completion Point: A</b>	
<b>Air-Conditioning, Refrigeration and Heating Helper – 250 Hours – SOC Code 49-9021</b>	
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 and use 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	Understand and apply Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), 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	Follow safety precautions when using hand and power tools.
01.12	Explain emergency procedures to follow in response to workplace accidents.

01.13	Create a disaster and/or emergency response plan.
02.0	Identify, use and maintain the tools and tool accessories used in the heating, air-conditioning and refrigeration industry--The student will be able to:
02.01	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.
02.02	Apply appropriate care and maintenance procedures for tools and tool accessories, following the directions in the tool-equipment manufacturer's manual.
03.0	Demonstrate mathematics knowledge and skills--The student 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.
04.0	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:
04.01	Explain the principles of electricity.
04.02	Explain single- and three-phase power distribution.
04.03	Define and explain watts, ohms, volts and amps.
04.04	Identify and explain electrical measuring tools and devices.
04.05	Explain the standards for and ways to measure watts, resistance, voltage and amperage, using appropriate instruments or devices.
04.06	Identify and explain appropriate electrical wiring symbols.
04.07	Draw and explain a wiring schematic diagram for a control system.
04.08	Create a wiring schematic for an air conditioner an electric furnace, a heat pump, an oil furnace (optional) and a gas furnace.
04.09	Explain codes and standards and safety requirements for working with the electrical components used in heating, air conditioning and refrigeration.
04.10	Troubleshoot protection devices, such as fuses and breakers.



05.0	Troubleshoot heating, air-conditioning and refrigeration electrical control systems and their components--The student will be able to:
05.01	Identify and explain the operations of electrical control systems and their components (zone damper motors, dual fuel lock out controls, outdoor thermostats/low ambient controls, defrost controls/timers and auxiliary heating controls, contactors, relays, circuit boards, motors, solenoids, and thermostats.).
05.02	Identify, install and troubleshoot controls for heating, air-conditioning and refrigeration systems.
05.03	Explain the operation of different types of electromechanical communicating, humidity control, and Wi-Fi operating thermostats.
05.04	Wire basic heating, air-conditioning and refrigeration systems.
05.05	Troubleshoot operational problems for different types of electromechanical communicating, humidity control, and Wi-Fi operating thermostats.
05.06	Explain the electrical and mechanical operations of the basic heat pump.
06.0	Select and test electrical generation and distribution components for commercial heating and air conditioning systems--The student will be able to:
06.01	Determine wire sizes and voltage drops.
06.02	Describe the operation of various types of transformers.
06.03	Draw and identify various power-transformers.
06.04	Test, size and replace protection devices such as fuses and breakers, motor starters and overloads.
07.0	Maintain, test and troubleshoot electrical motors and their components for commercial heating and air-conditioning systems--The student will be able to:
07.01	Explain how alternating current is developed and draw a sine wave.
07.02	Identify single-phase and three-phase wiring arrangements.
07.03	Explain how phase shift occurs in inductors and capacitors.
07.04	Describe the types of capacitors and their applications.

07.05	Explain the operation of single-phase and three-phase induction motors.
07.06	Identify the various types of single-phase motors and their applications.
07.07	Identify and explain the operations and applications of various types of electrical motors and their components as used in commercial heating and air-conditioning systems.
07.08	Maintain, test and troubleshoot various types of commercial electrical motors and their components as used in commercial heating and air-conditioning systems.
07.09	Demonstrate the proper use of motor testing equipment.
08.0	Troubleshoot and wire electrical motors and their components--The student will be able to:
08.01	Identify and explain the functions of various types of motors and their components.
08.02	Troubleshoot, test and analyze motors, using various methods.
08.03	Identify, troubleshoot and wire various types of electric motors.
08.04	Reverse the rotation of a motor.
09.0	Operate solid-state electronics as used in heating, air-conditioning and refrigeration systems--The student will be able to:
09.01	Explain the basic principles and functions of Direct Digital Control (DDC).
09.02	Explain basic solid-state circuits and boards.
09.03	Identify, test and replace circuits and boards.
09.04	Program a programmable thermostat.
10.0	Evaluate single-phase and three-phase power as used in heating, air-conditioning and refrigeration systems --The student will be able to:
10.01	Explain how the principles of designing an electrical system for residential heating and air-conditioning systems apply to commercial heating and air-conditioning systems.
10.02	Define and compare single- and multiphase voltage and current related to commercial heating and air-conditioning systems.

10.03	Calculate various circuit loads in commercial heating and air-conditioning applications using Ohm's law.
10.04	Troubleshoot electrical circuits for commercial heating and air-conditioning systems
11.0	Explain the function of basic electronics--The student will be able to:
11.01	Explain the basic theory of electronics and semiconductors.
11.02	Explain how various semiconductor devices such as diodes, LEDs and photo diodes work, and how they are used in power and control circuits.
11.03	Identify different types of resistors and explain how their resistance values can be determined.
11.04	Describe the operation and function of thermistors.

**Course Number: ACR0043**  
**Occupational Completion Point: B**  
**Air-Conditioning, Refrigeration and Heating Mechanic Assistant – 250 Hours – SOC Code 49-9021**

12.0	Describe the history and concepts of heating, air-conditioning and refrigeration--The student will be able to:
12.01	Explain the basic principles of heating, ventilation and air-conditioning.
12.02	Identify and explain the four major refrigeration components.
12.03	Identify and explain the characteristics of a compression-cycle refrigerant system.
12.04	Differentiate between air-conditioning and refrigeration.
12.05	Differentiate between split systems and package systems.
12.06	Describe the benefits of conditioned air and environments.
12.07	Identify various professional organizations, associations and societies and explain their purposes.
13.0	Explain the properties of matter and heat behavior--The student will be able to:

13.01	Describe and explain freezing point, critical temperature and absolute zero.
13.02	Explain the gas laws (Dalton, Boyle and Charles) used when dealing with air and its properties.
13.03	Describe matter, heat and heat transfer.
13.04	Differentiate between heat and temperature.
13.05	Explain and distinguish among the characteristics of the three states of matter.
13.06	Explain the relationship between temperature and humidity.
13.07	Differentiate between latent heat and sensible heat.
14.0	Analyze fluids, pressures, refrigerants and related codes--The student will be able to:
14.01	Identify the refrigeration cycle.
14.02	Identify and explain general safety issues and EPA rules and regulations regarding the handling of refrigerants.
14.03	Define and explain pressure, fluid and temperature.
14.04	Explain the standards for and ways to measure and calculate absolute and gauge pressures.
14.05	Identify and explain the classifications, properties and uses of different refrigerants.
14.06	Explain how fluids react and flow in a closed versus an open environment or vessel.
14.07	Define and identify "color-coding" of refrigerant cylinders.
14.08	Compare Pressure and Temperature (P/T) charts.
14.09	Explain the proper methods of transferring, storing and recovering refrigerants.
14.10	Explain the effects of an improper refrigerant and contaminants in a system.

15.0	Evaluate heating, air-conditioning and refrigeration system components and accessories--The student will be able to:
15.01	Explain the types, operation, use and maintenance requirements of
	a. Compressors (such as reciprocating, rotary, screw and scroll)
	b. Condensers and evaporators (such as evaporative condensers, evaporative coils, shell and tube, tube within a tube and fin and tube)
	c. Metering devices (such as adjusting automatic and thermostatic expansion valves, fixed orifices and other devices available on the local market)
15.02	Evaluate metering-device performance.
15.03	Explain the methods of compression, lubrication and compressor loading and unloading.
15.04	Analyze the operating condition of a compressor.
15.05	Test, troubleshoot and correct the causes of mechanical problems in a heating, air-conditioning and refrigeration system.
15.06	Identify the location and explain the uses of refrigerant flow accessories.
15.07	Identify the location and explain the uses of heating, air-conditioning and refrigeration-system accessories (such as receivers, dryers/filters, solenoid valves, heat exchangers, accumulators, suction filter, oil separators, evaporator pressure-regulating valve, crankcase pressure-regulating valves, hot gas bypass valves and check valves).
15.08	Evaluate system performance.
16.0	Select appropriate commercial compressors--The student will be able to:
16.01	Compare commercial-compressor requirements with those for residential and light commercial heating and air-conditioning systems.
16.02	Discuss appropriate commercial compressors for cooling requirements.
16.03	Describe the mechanical operation for each type of compressor.
16.04	Explain compressor lubrication methods.

16.05	Explain methods used to control compressor capacity.
16.06	Describe how compressor protection devices operate.
16.07	Perform the common procedures used when field servicing open and semi-hermetic compressors.
17.0	Test and adjust commercial evaporative condensers--The student will be able to:
17.01	Determine the proper air and fluid flow for commercial evaporative condensers.
17.02	Test and adjust the airflow for proper temperature difference.
17.03	Test and adjust the water flow for proper GPM and temperature difference.
17.04	Check for proper water treatment.
18.0	Maintain, test and troubleshoot commercial evaporators--The student will be able to:
18.01	Determine the operational requirements for evaporators used in commercial heating and air-conditioning applications.
18.02	Discuss appropriate evaporators for commercial heating and air-conditioning systems
18.03	Maintain, test and adjust various commercial heating and air-conditioning accessories.
18.04	Maintain, test and adjust commercial heating and air-conditioning accessories.
18.05	Compare commercial accessories with residential and light- commercial-heating and air-conditioning accessories.
18.06	Select the heating and air-conditioning accessories appropriate for various commercial applications.
19.0	Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry--The student will be able to:
19.01	Identify and explain the purpose of the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
19.02	Bend tubing, using tube benders.

19.03	Connect tubing using flared fittings and compression fittings.
19.04	Connect tubing, using solderless connectors.
19.05	Connect tubing, using a swaged-joint connection.
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.
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 heating, air-conditioning, refrigerant and ventilation accessories.
19.13	Fabricate and leak-test the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
19.14	Demonstrate proper safety measures when fabricating and servicing piping, tubing and fittings.

**Course Number: ACR0047**  
**Occupational Completion Point: C**  
**Air-Conditioning, Refrigeration and Heating Mechanic 1 – 250 Hours – SOC Code 49-9021**

20.0	Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing--The student will be able to:
20.01	Identify and explain various types of heating, air-conditioning and refrigeration piping.
20.02	Identify basic principles of sizing various heating, air conditioning, refrigeration and ventilation for various tasks.
20.03	Explain pressure and temperature drops.

21.0	Utilize and operate mechanical refrigeration servicing and testing equipment--The student will be able to:
21.01	Identify the effects of superheat and sub-cooling on a system.
21.02	Identify and explain the functions of servicing and testing equipment (such as vacuum pumps, micron gauges, EPA-approved equipment, leak detectors and charging systems).
21.03	Operate a refrigerant recovery system.
21.04	Apply specific safety and recovery practices for refrigerants used in the industry.
21.05	Apply specific safety practices as they relate to handling and storing cylinders and materials.
21.06	Explain the standards for and ways to measure, test, maintain and evacuate a mechanical heating, air-conditioning and refrigeration system.
21.07	Evacuate the refrigerant system with various vacuum methods.
21.08	Demonstrate compliance with Environmental Protection Agency (EPA) rules and regulations and, if possible, take the EPA test.
21.09	Charge various air-conditioning and mechanical refrigeration systems by various methods.
21.10	Demonstrate the effects of superheat and sub-cooling on a system utilizing test equipment (such as thermometers and gages).
22.0	Assist in the installation of a residential heating and air-conditioning system and determine start-up procedures--The student will be able to:
22.01	Read and comply with dispatch orders.
22.02	Explain local codes and ordinances.
22.03	Select and use appropriate tools and safety practices to test equipment.
22.04	Determine the electrical requirements of equipment.
22.05	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.
22.06	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.



22.07	Determine the temperature split/ difference across the evaporator.
22.08	Determine the temperature split/ difference across the condenser.
22.09	Write a service report.
22.10	Apply good customer-relations skills.
23.0	Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems--The student will be able to:
23.01	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.
23.02	Determine the start-up and checkout procedures recommended by different manufacturers.
23.03	Determine the electrical requirements of equipment.
23.04	Select and use appropriate tools, instruments and test equipment following safety precautions.
23.05	Determine the temperature split/ difference across the outdoor coil on a heat pump.
23.06	Determine the temperature split/ difference across the indoor coil on a heat pump.
23.07	Apply good customer-relations skills.
24.0	Demonstrate a working knowledge of refrigerants and oils--The student will be able to:
24.01	Identify the refrigerants in common use and state the types of applications in which each is used.
24.02	Explain the effects of releasing refrigerants into the atmosphere.
24.03	Explain how refrigerants are classified by their chemical composition.
24.04	Describe the color-coding scheme used to identify refrigerant cylinders.
24.05	Describe how azeotropes and near-azeotropes differ from each other and from so-called pure refrigerants.

24.06	Interpret a P-T chart for pure refrigerants, azeotrope, and near-azeotrope refrigerants and explain the difference between bubble point and dew point.
24.07	Demonstrate refrigerant leak detecting methods.
24.08	Identify the different types of oils used in refrigeration systems and explain their relationships to the various refrigerants.
24.09	Explain how to add and remove oil from a system.
24.10	Describe how to test oil for contamination.
25.0	Conduct system startup and shutdown--The student will be able to:
25.01	Start up and shut down an air handler and related forced-air distribution system.
25.02	Test compressor oil for acid contamination.
25.03	Add or remove oil from a semi-hermetic or open reciprocating compressor.
26.0	Explain the importance of employability and entrepreneurship skills--The student will be able to:
26.01	Identify and demonstrate positive work behaviors needed to be employable.
26.02	Develop personal career plan that includes goals, objectives and strategies.
26.03	Examine licensing, certification and industry credentialing requirements.
26.04	Maintain a career portfolio to document knowledge, skills and experience.
26.05	Evaluate and compare employment opportunities that match career goals.
26.06	Identify and exhibit traits for retaining employment.
26.07	Identify opportunities and research requirements for career advancement.
26.08	Research the benefits of ongoing professional development.

## **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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

SkillsUSA is the intercultural 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 (if applicable)**

In PSAV 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: Mathematics 10, Language 9, and Reading 9. 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(7), 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(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

## **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:** Air-Conditioning, Refrigeration and Heating Technology 2  
**Program Type:** Career Preparatory  
**Career Cluster:** Architecture and Construction

**PSAV**

Program Number	C400200
CIP Number	0647020108
Grade Level	30, 31
Standard Length	600 Hours
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9021 - Heating, Air Conditioning, and Refrigeration Mechanics and Installers
Basic Skills Level	Mathematics: 10 Language: 9 Reading: 9

**Purpose**

The purpose of this program is to prepare students for employment or advanced training in the heating, air-conditioning, and refrigeration and ventilation 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 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 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. There are two course options, ACR0044 OR ACR0045, for occupational completion point B.

**Air-Conditioning, Refrigeration and Heating Technology 1** is a core program. It is recommended student completes **Air-Conditioning, Refrigeration and Heating Technology 1**, or demonstrates mastery of the outcomes in that program, prior to enrollment in **Air-Conditioning, Refrigeration and Heating Technology 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	SOC Code
A	ACR0049	Air Conditioning, Refrigeration and Heating Mechanic 2		250 Hours	49-9021
B	ACR0044 <b>OR</b>	Air Conditioning, Refrigeration and Heating Technician <b>OR</b>	AC HEAT ME @7 G REFRG MECH 7 G	350 Hours	49-9021
	ACR0045	Refrigeration Mechanic		350 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 Use combustion-type heating servicing and testing equipment.
- 02.0 Troubleshoot combustion gas valves and regulators as used in heating, air-conditioning, refrigeration and ventilation systems.
- 03.0 Maintain, troubleshoot and repair commercial heating systems.
- 04.0 Explain how to install, maintain and repair heating, air-conditioning and refrigeration systems.
- 05.0 Demonstrate knowledge of retail refrigeration systems.
- 06.0 Demonstrate knowledge of commercial and industrial refrigeration systems.
- 07.0 Develop an understanding of hydronic systems.
- 08.0 Determine the properties of air.
- 09.0 Use a pressure enthalpy chart to diagram refrigerant cycles.
- 10.0 Explain the standards for and ways to measure indoor-air quality.
- 11.0 (Optional) Identify and understand pneumatic control systems for commercial heating and air-conditioning applications.
- 12.0 Develop an understanding of chilled systems.
- 13.0 (Optional) Maintain and repair thermal storage systems.
- 14.0 Read construction documents.
- 15.0 Interpret, use and modify construction drawings and specifications.
- 16.0 Design heating and cooling systems.
- 17.0 Troubleshoot and repair commercial heating and air-conditioning systems.
- 18.0 Calculate commercial heating and air-conditioning loads.
- 19.0 Install air distribution systems.
- 20.0 Evaluate commercial airside systems.
- 21.0 Balance an air distribution system.
- 22.0 Select energy conservation equipment.
- 23.0 Analyze building management systems.
- 24.0 Recommend alternative heating and cooling systems for various case studies.
- 25.0 Demonstrate a working knowledge of electrical generation and distribution components for commercial heating and air conditioning systems.
- 26.0 Demonstrate a working knowledge of refrigeration-system vibration and insulation.
- 27.0 Apply commercial refrigeration-pipe sizing and troubleshooting procedures.
- 28.0 Use refrigeration-systems skills in commercial applications.
- 29.0 Demonstrate a working knowledge of refrigerated storage systems.
- 30.0 Diagnose, maintain and repair ice-making systems.
- 31.0 Use refrigeration electrical-system skills in commercial applications.
- 32.0 Maintain and troubleshoot commercial refrigeration systems.



Florida Department of Education  
Student Performance Standards

Program Title: Air-Conditioning, Refrigeration and Heating Technology 2  
PSAV Number: C400200

<b>Course Number: ACR0049</b>	
<b>Occupational Completion Point: A</b>	
<b>Air-Conditioning, Refrigeration and Heating Mechanic 2 – 250 Hours – SOC Code 49-9021</b>	
01.0	Use combustion-type heating servicing and testing equipment--The student will be able to:
01.01	Explain combustion theory and the safety precautions for using combustion-type-heating servicing and testing equipment.
01.02	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).
01.03	Use the servicing and testing equipment.
01.04	Test, analyze and troubleshoot combustion-type-heating systems.
02.0	Troubleshoot combustion gas valves and regulators as used in heating, air-conditioning, refrigeration and ventilation systems--The student will be able to:
02.01	Identify and discuss the safety and regulation issues and concerns.
02.02	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).
02.03	Identify various types of gas valves and regulators.
02.04	Determine the application of gas valves and regulators.
02.05	Troubleshoot gas valves and regulators.
03.0	Maintain, troubleshoot and repair commercial heating systems--The student will be able to:
03.01	Identify the components of various commercial heating systems.

03.02	Explain the operational principles of various commercial heating systems.
03.03	Test and analyze heating air-distribution systems.
03.04	Maintain, troubleshoot and repair various commercial heating systems including a gas furnace and boiler, an oil furnace and boiler, an electric furnace, electric heaters, a heat pump and solar-heating systems.
04.0	Explain how to install, maintain and repair heating, air-conditioning and refrigeration systems--The student will be able to:
04.01	Follow safety precautions.
04.02	Describe new technologies in heating, air-conditioning and refrigeration installation, including variable-speed motors, heat-pipe systems, desiccant systems and gas-driven heating systems.
04.03	Explain how to lay out, construct and troubleshoot comfort systems.
04.04	Test and analyze systems.
04.05	Test and analyze heat-recovery systems.
05.0	Demonstrate knowledge of retail refrigeration systems--The student will be able to:
05.01	Describe the mechanical refrigeration cycle as it applies to retail refrigeration systems.
05.02	Explain the differences in refrigerants and applications in low-, medium- and high-temperature refrigeration systems.
05.03	Identify and describe the primary refrigeration cycle components used in retail refrigeration systems.
05.04	Identify and describe the supporting components and accessories used in retail refrigeration systems.
05.05	Describe the various methods of defrost used in retail refrigeration systems.
05.06	Identify and describe the applications for the various types of retail refrigeration systems.
05.07	Describe the control system components used in retail refrigeration systems.
05.08	Explain the operating sequence of a retail refrigeration system.

05.09	Interpret wiring diagrams and troubleshooting charts to isolate malfunctions in retail refrigeration systems.
06.0	Demonstrate knowledge of commercial and industrial refrigeration systems--The student will be able to:
06.01	Identify different types of refrigerated coolers and display cases and describe each one's common application.
06.02	Compare the basic components used in commercial/industrial refrigeration systems with those used in retail refrigeration systems.
06.03	Identify single, multiple and satellite compressor systems; describe the applications, installation considerations and advantages and disadvantages of each type.
06.04	Identify packaged condensing units and unit coolers; describe their applications, operation and installation considerations.
06.05	Identify two-stage compressors and explain their operation and applications.
06.06	Identify the various accessories used in commercial refrigeration systems and explain why each is used and where it should be installed in the system.
06.07	Identify the various refrigeration control devices and explain the purpose of each type and how it works.
07.0	Develop an understanding of hydronic systems--The student will be able to:
07.01	Explain the terms and concepts used when working with hot-water heating systems.
07.02	Identify the major components of hot-water heating systems.
07.03	Explain the purpose of each component of hot-water heating systems.
07.04	Describe the safety precautions used when working with hot water systems.
07.05	Identify the common piping configurations used with hot-water heating systems.
07.06	Explain the principles involved and describe the procedures used in balancing hydronic systems.
07.07	Select, calibrate and properly use the tools and instruments needed to balance hydronic systems.
07.08	Read the pressure across a water system circulating pump.

**Course Number: ACR0044**  
**Occupational Completion Point: B**  
**Air-Conditioning, Refrigeration and Heating Technician – 350 Hours – SOC Code 49-9021**

**Note: Students may choose one of the following courses for the completion of OCP B ‘Air-Conditioning, Refrigeration and Heating Technician’ – ACR0044 or ‘Refrigeration Technician’ – ACR0045.**

08.0 Determine the properties of air--The student will be able to:

08.01 Explain the principles of psychrometrics.

08.02 Identify and explain the components and uses of a psychrometric meter.

08.03 Identify indoor-air-quality concerns as related to psychrometrics.

08.04 Discuss current issues and concerns (such as indoor-air quality, the ozone layer and computer technology) in the heating, air-conditioning and refrigeration industry and in the environment and explain their future ramifications.

08.05 Determine the properties of air, using a psychrometric chart.

08.06 Follow safety precautions.

08.07 Identify and explain the different types and benefits of air-filtration systems, air-handling systems and ventilation systems.

08.08 Fabricate, operate, maintain and troubleshoot air-filtration systems, air-handling systems and ventilation systems.

09.0 Use a pressure enthalpy chart to diagram refrigerant cycles--The student will be able to:

09.01 Identify all components of the pressure enthalpy chart.

09.02 Define enthalpy and entropy.

10.0 Explain the standards for and ways to measure indoor-air quality--The student will be able to:

10.01 Define indoor-air quality.

10.02 Identify and explain the codes and standards regarding indoor-air quality.

10.03	Select and use indoor-air-quality measuring devices.
10.04	Explain the standards for and ways to measure indoor-air quality using various methods.
11.0	(Optional) Identify and understand pneumatic control systems for commercial heating and air-conditioning applications--The student will be able to:
11.01	Identify pneumatic control systems.
11.02	Understand the functions of direct acting and reverse acting controls of pneumatic control systems.
12.0	Develop an understanding of chilled systems--The student will be able to:
12.01	Explain the terms and concepts used when working with chilled-water cooling systems.
12.02	Identify the major components of chilled-water cooling and dual-temperature water systems.
12.03	Explain the purpose of each component of chilled-water cooling and dual-temperature water systems.
12.04	Describe the safety precautions used when working with chilled-water systems.
12.05	Explain the differences between reciprocating, rotary screw, scroll and centrifugal chillers.
13.0	(Optional) Maintain and repair thermal storage systems--The student will be able to:
13.01	Apply appropriate codes, standards and safety practices.
13.02	Describe the benefits and limitations of each type.
13.03	Explain the operational principles of a thermal storage system.
13.04	Identify and explain various types of thermal storage systems.
13.05	Troubleshoot and test various types of thermal storage systems.
14.0	Read construction documents--The student will be able to:

14.01	Recognize and identify basic construction drawing terms, components and symbols.
14.02	Relate information on construction drawings to actual locations on the print.
14.03	Recognize different classifications of construction drawings.
14.04	Interpret and use drawing dimensions.
15.0	Interpret, use and modify construction drawings and specifications--The student will be able to:
15.01	Read mechanical plans within a set of construction drawings explain their relationship.
15.02	Compare mechanical plans with the actual installation of duct and pipe runs, fittings and sections.
15.03	Interpret specification documents and apply them to the plans.
15.04	Interpret shop drawings and apply them to the plans and specifications.
15.05	Develop a field set of as-built drawings.
15.06	Identify the steps required for transferring design information to component production.
15.07	List and classify materials most commonly used in HVAC systems.
16.0	Design heating and cooling systems--The student will be able to:
16.01	Identify and describe the steps in the system design process.
16.02	Use construction drawings or an actual job site to obtain information needed to complete heating and cooling load estimates.
16.03	Identify the factors that affect heat gains and losses to a building and describe how these factors influence the design process.
16.04	Complete a load estimate to determine the heating and/or cooling load of a building.
16.05	State the principles that affect the selection of equipment to satisfy the calculated heating and/or cooling load.

16.06	Select heating and/or cooling equipment using manufacturers' product data.
16.07	Identify the various types of duct systems and explain why and where each type is used.
16.08	Demonstrate the effect of fittings and transitions on duct system design.
16.09	Use a friction loss chart and duct sizing table to size duct.
16.10	Install insulation and vapor barriers used in duct systems.
16.11	Select and install refrigerant and condensate piping following proper design principles.
17.0	Troubleshoot and repair commercial heating and air-conditioning systems--The student will be able to:
17.01	Keep a record of the installation, maintenance and repair of commercial heating and air-conditioning systems.
17.02	Apply local and national codes and safety practices.
17.03	Lay out a commercial heating and air-conditioning system.
17.04	Lay out a typical split commercial air-conditioning system.
17.05	Lay out a typical split commercial heating system.
17.06	Maintain, test, analyze and repair various types of commercial heating and air-conditioning systems.
17.07	Maintain, troubleshoot and repair water-cooled condensers
18.0	Calculate commercial heating and air-conditioning loads--The student will be able to:
18.01	Explain conduction as a heat-load source.
18.02	Describe the implications of conducting and the resistance values for different types of construction materials.
18.03	Interpret heat-transfer tables and define values U, K, C and R.

18.04	Locate the total heat-transfer value of any surface.
18.05	Explain infiltration and exfiltration/ventilation as a heat-load source.
18.06	Explain a product heat-load source.
18.07	Explain miscellaneous loads (people, motors and equipment) as heat-load sources.
18.08	Explain the purpose of vapor barriers.
18.09	Interpret tables of specific heat values as applied to commercial heating and air-conditioning systems.
18.10	Calculate and design systems.
18.11	Calculate cooling and heating equipment sizes.
18.12	Design and identify methods of installing air-movement systems.
19.0	Install air distribution systems--The student will be able to:
19.01	Describe airflow and pressures in a basic forced-air distribution system.
19.02	Explain the differences between propeller and centrifugal fans and blowers.
19.03	Identify the various types of duct systems and explain why and where each type is used.
19.04	Demonstrate or explain the installation of metal, fiberboard and flexible duct.
19.05	Demonstrate or explain the installation of fittings and transitions used in duct systems.
19.06	Identify and explain the operations of electrical control systems and their components (zone damper motors).
19.07	Demonstrate or explain the use and installation of dampers used in duct systems.
19.08	Demonstrate or explain the use and installation of insulation and vapor barriers used in duct systems.



19.09	Identify instruments used to make measurements in air systems and explain the use of each instrument.
19.10	Make basic temperature, air pressure and velocity measurements in an air distribution system.
20.0	Evaluate commercial airside systems--The student will be able to:
20.01	Identify the differences in various types of commercial all-air systems.
20.02	Identify the type of building in which a particular type of system is used.
20.03	Explain the typical range of capacities for a commercial air system.
21.0	Balance an air distribution system--The student will be able to:
21.01	Explain the fan and pump laws.
21.02	Use a psychrometric chart to evaluate air properties and changes in air properties.
21.03	Explain the principles involved in the balancing of air and water distribution systems.
21.04	Define common terms used by manufacturers when describing grilles, registers and diffusers.
21.05	Identify and use the tools and instruments needed to balance air distribution systems.
21.06	Change the speed of an air distribution system supply fan.
22.0	Select energy conservation equipment--The student will be able to:
22.01	Identify and explain the operation of energy conservation equipment.
22.02	Operate selected energy conservation equipment.
23.0	Analyze building management systems--The student will be able to:
23.01	Identify the major components of a building management system and describe how they fit together.

23.02	Explain a basic direct digital controller.
24.0	Recommend alternative heating and cooling systems for various case studies--The student will be able to:
24.01	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.
24.02	Describe alternative technologies for heating such as ductless systems, computer rooms, chilled beams and multi-zone.

<b>Course Number: ACR0045</b>	
<b>Occupational Completion Point: B</b>	
<b>Refrigeration Mechanic – 350 Hours – SOC Code 49-9021</b>	
<b>Note: Students may choose one of the following courses for the completion of OCP B: 'Air-Conditioning, Refrigeration and Heating Technician' – ACR0044 or 'Refrigeration Technician' – ACR0045.</b>	
26.0	Demonstrate a working knowledge of electrical generation and distribution components for commercial heating and air conditioning systems--The student will be able to:
26.01	Calculate loads and design and lay out a commercial refrigeration system.
26.02	Identify and explain commercial refrigeration-pressure-regulation devices, controls and components.
26.03	Install, service and repair ice machines and specialty refrigeration systems.
26.04	Test and troubleshoot refrigerant-pressure-regulating devices, controls and components.
26.05	Apply local and national codes and mechanical safety practices.
27.0	Demonstrate a working knowledge of refrigeration-system vibration and insulation--The student will be able to:
27.01	Describe the applications of vibration eliminators.
27.02	Identify and select the correct insulation for commercial application.
28.0	Apply commercial refrigeration-pipe sizing and troubleshooting procedures--The student will be able to:

28.01	Determine the capacities of refrigerant lines, including the amounts they will hold, equivalent lengths of fittings and the total effective length for various pipelines.
28.02	Identify and apply industry-approved installation procedures.
28.03	Troubleshoot refrigeration-pipe-sizing problems.
a.	Explain the use of traps in suction-line risers.
b.	Explain pressure drop.
c.	Calculate pressure drop in liquid-line risers.
d.	Size double risers, hot-gas lines and liquid lines from condenser to receiver.
29.0	Use refrigeration-systems skills in commercial applications--The student will be able to:
29.01	Identify and apply the safety practices used with commercial refrigeration systems.
29.02	Apply refrigeration-systems skills to commercial refrigeration systems.
a.	Perform dehydration, evacuation and recovery procedures.
b.	Interpret blueprints and mechanical drawings.
c.	Service and charge a refrigeration system.
d.	Test, analyze and replace compressors.
e.	Retrofit alternative refrigerants and oils.
30.0	Demonstrate a working knowledge of refrigerated storage systems--The student will be able to:
30.01	Identify and differentiate among various types of cases, such as service cases and self-service cases.
30.02	Explain the operation of air-screen freezers, glass-door freezers, coffin cases and walk-in coolers.

30.03	Differentiate among medium-temperature, low-temperature and ultralow-temperature systems.
30.04	Explain various defrost methods.
30.05	Maintain, test and troubleshoot defrost components.
30.06	Identify and explain the components of various refrigerated storage systems.
30.07	Maintain, test and troubleshoot various refrigerated storage system components.
31.0	Diagnose, maintain and repair ice-making systems--The student will be able to:
31.01	Identify and explain various types and operations of ice-making systems.
31.02	Maintain, test, troubleshoot and repair various types of ice-making systems, following the manufacturers' recommendations.
31.03	Identify and explain the different types of water-treatment methods and systems.
31.04	Analyze water to identify water problems and the proper treatments.
32.0	Use refrigeration electrical-system skills in commercial applications--The student will be able to:
32.01	Apply electrical safety practices for commercial refrigeration systems.
32.02	Apply refrigeration electrical-system skills to commercial refrigeration systems:
	a. Interpret symbols of electrical components and diagrams.
	b. Interpret schematics and diagrams.
	c. Apply electrical theory and calculations.
	d. Explain the principles of designing electrical systems.

e. Test and troubleshoot single- and three-phase motors and variable speed electronic commutated motors (ECM).

32.03 Test the solid-state components used in commercial refrigeration systems.

32.04 Troubleshoot and diagnose the electrical circuits used in commercial refrigeration systems.

32.05 Test and troubleshoot the thermostatic controls used in commercial refrigeration systems.

33.0 Maintain and troubleshoot commercial refrigeration systems--The student will be able to:

33.01 Follow appropriate safety precautions for commercial refrigeration systems.

33.02 Identify and explain the operations of various types of commercial refrigeration systems and applications, such as single, multiplex and cascade systems.

33.03 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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

### **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 (if applicable)**

In PSAV 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: Mathematics 10, Language 9, and Reading 9. 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(7), 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(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

## **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

**PSAV**

Program Number	C410400
CIP Number	0648070303
Grade Level	30,31
Standard Length	1200 Hours
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-3012 - Helpers—Carpenters 51-7011 - Cabinetmakers and Bench Carpenters
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

**Purpose**

The purpose of this program is to prepare students for employment in the carpentry 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	SOC Code
A	BCV0200	Cabinetmaker Helper	CAB WOODWK @7 7G	300 Hours	47-3012
B	BCV0235	Cabinet Finisher	CARPENTRY @7 7G	150 Hours	51-7011
C	BCV0240	Cabinet Assembler	BLDG CONSTR @7 7G	300 Hours	51-7011
D	BCV0243	Cabinetmaker	TEC CONSTR @7 7G	450 Hours	51-7011

## **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 Create basic construction drawings.
- 05.0 Recommend appropriate building materials for specific scenarios.
- 06.0 Select appropriate fasteners and hardware for specific scenarios.
- 07.0 Apply occupational safety skills.
- 08.0 Select and use hand and power tools relevant to the cabinetmaking profession.
- 09.0 Fasten stock and joints.
- 10.0 Read and design construction documents.
- 11.0 Install cabinets and components.
- 12.0 Investigate sustainability issues related to the cabinetmaking professions.
- 13.0 Identify and describe interior and exterior doors (wood and/or metal).
- 14.0 Install trim and finish carpentry using plans and specifications.
- 15.0 Assemble cabinet doors.
- 16.0 Install ceramic tile.
- 17.0 Install various countertop surfaces.
- 18.0 Explain the importance of employability and entrepreneurship skills.
- 19.0 Prepare cabinets for finish.
- 20.0 Apply finishes.
- 21.0 Install cabinets.
- 22.0 Apply laminates.
- 23.0 Plan, design and lay out casework.
- 24.0 Utilize power tools specific to cabinet making.
- 25.0 Construct joints.
- 26.0 Cut casework components.
- 27.0 Assemble casework components.
- 28.0 Construct cabinet drawers.
- 29.0 Construct cabinet doors.
- 30.0 Construct curved pieces.
- 31.0 Construct millwork details.

Florida Department of Education  
Student Performance Standards

Program Title: Cabinetmaking  
PSAV Number: I480704

<b>Course Number: BCV0200</b>	
<b>Occupational Completion Point: A</b>	
<b>Carpenter Helper – 300 Hours – SOC Code 47-3012</b>	
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 and algebra skills to solve math problems related to cabinetmaking with and without a calculator.
03.02	Demonstrate knowledge of arithmetic operations.
03.03	Solve problems for distance, area and volume.

03.04	Analyze and apply data and measurements to solve problems and interpret documents.
03.05	Construct charts/tables/graphs using functions and data.
04.0	Create basic construction drawings and/ or sketches--The student will be able to:
04.01	Recognize and identify basic construction drawing terms, components and symbols.
04.02	Relate information on construction drawings to actual locations on the print.
04.03	Recognize different classifications of construction drawings.
04.04	Interpret and use drawing dimensions and architectural scales.
05.0	Recommend appropriate building materials for specific scenarios--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.
05.04	Identify defects and blemishes that affect the durability and strength of lumber.
05.05	Explain the effects of temperature extremes, chemical reaction and moisture content on building materials.
05.06	Explain the uses of various types of engineered lumber.
06.0	Select appropriate fasteners and hardware for specific scenarios--The student will be able to:
06.01	Identify the fasteners commonly used in cabinetmaking.
06.02	Identify the hardware commonly used in cabinetmaking.
07.0	Apply occupational safety skills--The student will be able to:
07.01	Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200)
07.02	Explain the purpose of the Occupational Safety and Health Administration (OSHA).
07.03	Identify health-related problems that may result from exposure to hazardous materials.
07.04	Describe the proper precautions for handling hazardous materials.
07.05	Explain eligibility and the procedures for obtaining worker's compensation.

07.06	Explain the importance of complying with the Americans with Disabilities Act (ADA) requirements.
08.0	Select and use hand and power tools relevant to the cabinetmaking profession--The student will be able to:
08.01	Identify the hand tools commonly used by carpenters and describe their uses.
08.02	Use hand tools in a safe and appropriate manner.
08.03	State the general safety rules for operating all power tools, regardless of type.
08.04	State the general rules for properly maintaining all power tools, regardless of type.
08.05	Identify the portable power tools commonly used by carpenters and describe their uses.
08.06	Use portable power tools in a safe and appropriate manner.
09.0	Fasten stock and joints--The student will be able to:
09.01	Identify types of glues and fasteners and describe their applications.
09.02	Fasten stock with glue and clamps.
09.03	Fasten stock and joints with appropriate fasteners such as nails, staples, screws and bolts.
09.04	Fill and finish nail and screw holes with fillers and plugs.
09.05	Glue and clamp stock using various techniques.
10.0	Read and design construction documents--The student will be able to:
10.01	Explain the types of drawings usually included in a set of plans and list the information found on each type.
10.02	Identify the different types of lines used on construction drawings.
10.03	Identify selected abbreviations commonly used on plans.
10.04	Read and interpret plans, elevations, schedules, sections and details contained in basic construction drawings.
10.05	State the purpose of written specifications.
10.06	Identify and describe the parts of a specification.
10.07	Conduct quantity takeoff for materials.
10.08	Design millwork and draw details in construction documents for a given scenario.

11.0	Install cabinets and components--The student will be able to:
11.01	Install hardware such as hinges, catches, pulls, knobs and guides on assembled cabinets.
11.02	Install fasteners.
11.03	Install drawers.
11.04	Install various types of doors including overlay, lipped and flush.
11.05	Install adjustable shelving.
11.06	Install glass panels and metal grills.
11.07	Install specialty hardware such as a lazy Susan, wire racks and "pull-outs".
11.08	Install sliding doors and track.
12.0	Investigate sustainability issues related to the cabinetmaking profession--The student will be able to:
12.01	Describe the impact of the construction industry on the natural environment.
12.02	Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.
12.03	Recommend sustainable alternatives to conventional cabinetmaking practices.
12.04	Identify specific practices that can lessen adverse impacts on the environment.

**Course Number: BCV0235**  
**Occupational Completion Point: B**  
**Cabinet Finisher – 150 Hours – SOC Code 51-7011**

13.0	Identify and describe interior and exterior doors (wood and/or metal)--The student will be able to:
13.01	Identify the types and parts of door systems.
13.02	Identify door jamb components.
13.03	Identify door hardware.
14.0	Install trim and finish carpentry using plans and specifications--The student will be able to:
14.01	Read an architect's scale to determine measurements for a trim and finish carpentry job.
14.02	Cut and apply trim such as crown molding, baseboard, door and window molding, wainscoting and chair rail.

15.0	Assemble cabinet doors--The student will be able to:
15.01	Select appropriate tools and materials for project.
15.02	Cut and glue rails, stiles and panels.
15.03	Select appropriate hinges and door pulls for installation.
16.0	Install ceramic tile--The student will be able to:
16.01	Select appropriate tools and materials for project.
16.02	Prepare surfaces for tile installation.
16.03	Layout, cut and install tile backsplash.
16.04	Patch and repair tile affected by cabinet renovation project.
17.0	Install various countertop surfaces--The student will be able to:
17.01	Install stone (granite, quartz or marble) countertop.
17.02	Install solid surface countertop.
17.03	Install tile countertop.
17.04	Install wood countertop.
17.05	Install stainless steel countertop.
17.06	Install plastic laminate countertop.

**Course Number: BCV0240**  
**Occupational Completion Point: C**  
**Cabinet Assembler – 300 Hours – SOC Code 51-7011**

18.0	Explain the importance of employability and entrepreneurship skills--The student will be able to:
18.01	Identify and demonstrate positive work behaviors needed to be employable.
18.02	Develop personal career plan that includes goals, objectives and strategies.
18.03	Examine licensing, certification and industry credentialing requirements.
18.04	Maintain a career portfolio to document knowledge, skills and experience.



18.05	Evaluate and compare employment opportunities that match career goals.
18.06	Identify and exhibit traits for retaining employment.
18.07	Identify opportunities and research requirements for career advancement.
18.08	Research the benefits of ongoing professional development.
18.09	Examine and describe entrepreneurship opportunities as a career planning option.
19.0	Prepare cabinets for finish--The student will be able to:
19.01	Fill nail and screw holes.
19.02	Install wood plugs in prepared holes.
19.03	Sand a cabinet and joints for finish.
19.04	Select and apply proper filler.
19.05	Sand wood surfaces for finishing.
19.06	Stain, bleach, fill and seal wood surfaces as needed.
20.0	Apply finishes--The student will be able to:
20.01	Apply various types of finishes including lacquer-based, water-based, oil-based, enamel and polyurethane.
20.02	Apply the types of finishes that the local market demands.
20.03	Observe safety precautions when applying finishes, including wearing respirator and protective clothing approved by National Institute of Occupational Safety and Health (NIOSH).
21.0	Install cabinets--The student will be able to:
21.01	Load and secure casework for hauling.
21.02	Check walls and floors for level and plumb.
21.03	Determine fasteners for block or walls.
21.04	Install upper and lower cabinets and other casework.
21.05	Fasten a suspended cabinet unit to ceiling.
21.06	Install countertops, including sink cutouts and back splash.

21.07	Cut and install molding and trim.
21.08	Adjust doors and drawers.
21.09	Clean work site.
22.0	Apply laminates--The student will be able to:
22.01	Lay out and cut core stock to specifications.
22.02	Lay out and cut laminate to specification.
22.03	Apply adhesive.
22.04	Apply laminate to core stock.
22.05	Trim and file plastic laminate edges.
22.06	Clean laminated surfaces.
22.07	Laminate a curved surface.
22.08	Repair laminate defects.

**Course Number: BCV0243**  
**Occupational Completion Point: D**  
**Cabinetmaker – 450 Hours – SOC Code 51-7011**

23.0	Plan, design and lay out casework--The student will be able to:
23.01	Convert measurements from English to the metric system and from the metric system to the English system.
23.02	Draw a set of plans to scale.
23.03	Make a rod layout.
23.04	Develop a plan or procedure and a cut list for a specific job.
23.05	Estimate the materials required for the job.
23.06	Estimate labor and materials cost, using computer-application programs, if available.
23.07	Select and match wood stock for compatibility of grain and color.
23.08	Design and layout cabinets, using a Computer-Assisted Design (CAD) program, if available.

24.0	Utilize power tools specific to cabinet making--The student will be able to:
24.01	Operate both portable and stationary power tools, observing safety precautions.
24.02	Maintain power tools according to the manufacturer's specifications.
25.0	Construct joints--The student will be able to:
25.01	Construct various types of joints including butt, dado, rabbeted, lap, miter, splined, tongue-and-groove and mortise-and-tenon.
25.02	Install dowels in common wood joints.
25.03	Install biscuit spline in common wood joints.
26.0	Cut casework components--The student will be able to:
26.01	Cut frame stiles and rails.
26.02	Cut end, top and bottom panels.
26.03	Cut partitions and sleepers.
26.04	Cut shelf panels.
26.05	Cut skeleton frame stiles and rails.
26.06	Cut a toe board and a back panel.
26.07	Cut a casework top or countertop and a back splash.
26.08	Cut drawer front, sides, back and bottom.
26.09	Cut wood drawer guides.
26.10	Cut solid, flexible and paneled doors.
26.11	Route or shape casework components.
27.0	Assemble casework components--The student will be able to:
27.01	Assemble face frame, panels, toe boards and skeleton frame.
27.02	Fasten a top or countertop and a back splash to casework.
27.03	Assemble drawers.

27.04	Assemble flexible and paneled doors.
27.05	Install shelving.
27.06	Attach trim, molding and edge banding.
28.0	Construct cabinet drawers--The student will be able to:
28.01	Make various types of drawers including overlay, lipped and flush.
28.02	Construct drawer guides.
29.0	Construct cabinet doors--The student will be able to:
29.01	Make solid and tambour doors.
29.02	Make a frame and panel door.
29.03	Cut and set glass in a frame.
29.04	Band edges of solid doors.
29.05	Construct wood-door tracks.
30.0	Construct curved pieces--The student will be able to:
30.01	Cut a curved piece from solid stock.
30.02	Make a curved piece by saw kerfing.
30.03	Construct a curved piece, using curved segments.
30.04	Construct a curved piece by laminating thin strips.
31.0	Construct millwork details--The student will be able to:
31.01	Build shaped moldings to specifications.
31.02	Cut built-up moldings.
31.03	Cut a cornice.

## **Additional Information**

### **Laboratory Activities**

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

### **Career and Technical Student Organization (CTSO)**

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

### **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 (if applicable)**

In PSAV 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: Mathematics 9, Language 9, and Reading 9. 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(7), 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(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

### **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 1  
**Program Type:** Career Preparatory  
**Career Cluster:** Architecture and Construction

**PSAV**

Program Number	C510100
CIP Number	0646020111
Grade Level	30, 31
Standard Length	600 Hours
Teacher Certification	Refer to the <b>Program Structure</b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-3012 - Helpers--Carpenters 47-2031 - Carpenters
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

**Purpose**

The purpose of this program is to prepare students for employment in the carpentry industry with a stress on basic carpentry skills. 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 cabinetmaking skills, as well as 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 two occupational completion points. The recommended sequence allows students to complete specified portions of the program for employment or to remain for additional 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.

After completing the core, carpentry students may opt to take either the Trim and Finish Carpentry course or the Frame Carpentry course as exit-point goals. However, in order to proceed to Carpentry, students must first complete both the Trim and Finish Carpentry course and the Frame Carpentry course in addition to the core or demonstrate mastery of the performance standards contained in those courses.

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	SOC Code
A	BCV0107	Carpenter Helper	CAB WOODWK @7 7G	300 Hours	47-3012
B	BCV0111	Trim & Finish Carpenter	CARPENTRY @7 7G BLDG CONST @7 7G TEC CONSTR @7 7G	300 Hours	47-2031



## **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 carpentry profession.
- 03.0 Demonstrate mathematics knowledge and skills relevant to the carpentry field.
- 04.0 Create basic construction drawings and/or sketches.
- 05.0 Recommend appropriate building materials for specific scenarios.
- 06.0 Select appropriate fasteners and hardware for specific scenarios.
- 07.0 Apply occupational safety skills.
- 08.0 Select and use hand and power tools relevant to the carpentry profession.
- 09.0 Fasten stock and joints.
- 10.0 Read and design construction documents.
- 11.0 Assemble and install cabinets and components.
- 12.0 Investigate sustainability issues related to the carpentry professions.
- 13.0 Identify and describe interior and exterior doors (wood and/or metal).
- 14.0 Install trim and finish carpentry using plans and specifications.
- 15.0 Cut and install framing members for a floor (wood and/or metal).
- 16.0 Cut and install a wall and partition framing (wood and/or metal).
- 17.0 Install an interior wall and ceiling materials.
- 18.0 Lay out and construct an interior-stair system.
- 19.0 Comply with hurricane codes.
- 20.0 Frame a roof.
- 21.0 Apply roofing applications.
- 22.0 Apply thermal and moisture protection.
- 23.0 Frame walls using cold-formed steel.
- 24.0 Perform site-preparation and layout activities.
- 25.0 Explain the importance of employability and entrepreneurship skills.

Florida Department of Education  
Student Performance Standards

Program Title:      Carpentry 1  
PSAV Number:      C510100

<b>Course Number: BCV0107</b>	
<b>Occupational Completion Point: A</b>	
<b>Carpenter Helper – 300 Hours – SOC Code 47-3012</b>	
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 carpentry 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 carpentry field--The student will be able to:
03.01	Apply geometry and algebra skills to solve math problems related to carpentry with and without a calculator.
03.02	Demonstrate knowledge of arithmetic operations.
03.03	Solve problems for distance, perimeter, area and volume.

03.04	Analyze and apply data and measurements to solve problems and interpret documents.
03.05	Construct charts/tables/graphs using functions and data.
04.0	Create basic construction drawings and/or sketches--The student will be able to:
04.01	Recognize and identify basic construction drawing terms, components and symbols.
04.02	Relate information on construction drawings to actual locations on the print.
04.03	Recognize different classifications of construction drawings.
04.04	Interpret and use drawing dimensions and architectural scales.
05.0	Recommend appropriate building materials for specific scenarios--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.
05.04	Identify defects and blemishes that affect the durability and strength of lumber.
05.05	Explain the effects of temperature extremes, chemical reaction and moisture content on building materials.
05.06	Explain the uses of various types of engineered lumber.
06.0	Select appropriate fasteners and hardware for specific scenarios--The student will be able to:
06.01	Identify the fasteners commonly used in carpentry and/or cabinetmaking.
06.02	Identify the hardware commonly used in carpentry and/or cabinetmaking.
07.0	Apply occupational safety skills--The student will be able to:
07.01	Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200)
07.02	Explain the purpose of the Occupational Safety and Health Administration (OSHA).
07.03	Identify health-related problems that may result from exposure to hazardous materials.
07.04	Describe the proper precautions for handling hazardous materials.
07.05	Explain eligibility and the procedures for obtaining worker's compensation.

07.06	Explain the importance of complying with the Americans with Disabilities Act (ADA) requirements.
08.0	Select and use hand and power tools relevant to the carpentry profession--The student will be able to:
08.01	Identify the hand tools commonly used by carpenters and describe their uses.
08.02	Use hand tools in a safe and appropriate manner.
08.03	State the general safety rules for operating all power tools, regardless of type.
08.04	State the general rules for properly maintaining all power tools, regardless of type.
08.05	Identify the portable power tools commonly used by carpenters and describe their uses.
08.06	Use portable power tools in a safe and appropriate manner.
09.0	Fasten stock and joints--The student will be able to:
09.01	Identify types of glues and fasteners and describe their applications.
09.02	Fasten stock with glue and clamps.
09.03	Fasten stock and joints with appropriate fasteners such as nails, staples, screws and bolts.
09.04	Fill and finish nail and screw holes with fillers and plugs.
09.05	Glue and clamp stock using various techniques.
10.0	Read and design construction documents--The student will be able to:
10.01	Explain the types of drawings usually included in a set of plans and list the information found on each type.
10.02	Identify the different types of lines used on construction drawings.
10.03	Identify selected abbreviations commonly used on plans.
10.04	Read and interpret plans, elevations, schedules, sections and details contained in basic construction drawings.
10.05	State the purpose of written specifications.
10.06	Identify and describe the parts of a specification.
10.07	Conduct quantity takeoff for materials.
10.08	Design millwork and draw details in construction documents for a given scenario.

11.0	Install cabinets and components--The student will be able to:
11.01	Install hardware such as hinges, catches, pulls, knobs and guides on assembled cabinets.
11.02	Install fasteners.
11.03	Install drawers.
11.04	Install various types of doors including overlay, lipped and flush.
11.05	Install adjustable shelving.
11.06	Install glass panels and metal grills.
11.07	Install specialty hardware such as a lazy Susan, wire racks and "pull-outs".
11.08	Install sliding doors and track.
12.0	Investigate sustainability issues related to the carpentry and/or cabinetmaking professions--The student will be able to:
12.01	Describe the impact of the construction industry on the natural environment.
12.02	Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.
12.03	Recommend sustainable alternatives to conventional carpentry and/or cabinetmaking practices.
12.04	Identify specific practices that can lessen adverse impacts on the environment.

<b>Course Number: BCV0111</b>	
<b>Occupational Completion Point: B</b>	
<b>Trim &amp; Finish Carpenter – 300Hours – SOC Code 47-2031</b>	
13.0	Identify and describe interior and exterior doors (wood and/or metal)--The student will be able to:
13.01	Identify the types and parts of door systems.
13.02	Identify door jamb components.
13.03	Identify door hardware.
14.0	Install trim and finish carpentry using plans and specifications--The student will be able to:
14.01	Read an architect's scale to determine measurements for a trim and finish carpentry job.
14.02	Cut and apply trim such as crown molding, baseboard, door and window molding, wainscoting and chair rail.

15.0	Cut and install framing members for a floor (wood and/or metal)--The student will be able to:
15.01	Identify and describe floor-framing members including subfloor.
15.02	Identify supports for structures (e.g., sills, columns, beams and girders).
15.03	Identify various types of joists and openings, including joists for a cantilevered floor.
15.04	Identify various types of bridging.
15.05	Identify various types of subfloors, applying fastening techniques.
16.0	Cut and install a wall and partition framing (wood and/or metal)--The student will be able to:
16.01	Identify framing members used in wall and partition construction.
16.02	Lay out wall lines and partition locations on a floor.
16.03	Lay out walls for studs, doors and windows.
16.04	Identify studs, trimmers, cripples, headers and fire stops to length.
16.05	Identify T's, corners and headers.
16.06	Identify wall layout.
16.07	Identify wall sheathing and/or diagonal bracing.
16.08	Identify and describe insulation materials and a vapor barrier.
17.0	Install an interior wall and ceiling materials--The student will be able to:
17.01	Identify and describe furring strips.
17.02	Identify and describe drywall materials.
17.03	Identify paneling and trim.
17.04	Identify ceiling materials and systems.
18.0	Lay out and construct an interior-stair system--The student will be able to:
18.01	Identify the types and styles of interior-stair systems.
18.02	Identify the components of an interior-stair system.

18.03	Calculate the number of risers and treads for an interior-stair system.
18.04	Describe an interior-stair system (rough and finish).
19.0	Comply with hurricane codes--the student will be able to:
19.01	Install hurricane anchors.
19.02	Install hurricane clips.
19.03	Install hurricane straps.
19.04	Explain the purpose and importance of the codes relating to hurricanes.
20.0	Frame a roof--The student will be able to:
20.01	Understand the terms associated with roof framing.
20.02	Identify the roof framing members used in gable and hip roofs.
20.03	Identify the methods used to calculate the length of a rafter.
20.04	Identify the various types of trusses used in roof framing.
20.05	Use a rafter framing square, speed square and calculator in laying out a roof.
20.06	Identify various types of sheathing used in roof construction.
20.07	Frame a gable roof with vent openings.
20.08	Frame a roof opening.
20.09	Erect a gable roof using trusses.
20.10	Estimate the materials used in framing and sheathing a roof.
21.0	Apply roofing applications--The student will be able to:
21.01	Identify the materials and methods used in roofing.
21.02	Explain the safety requirements for roof jobs.
21.03	Install fiberglass shingles on gable and hip roofs.
21.04	Close up a valley using fiberglass shingles.



21.05	Explain how to make various roof projections watertight when using fiberglass shingles.
21.06	Complete the proper cuts and install the main and hip ridge caps using fiberglass shingles.
21.07	Lay out, cut and install a cricket or saddle.
21.08	Install wood shingles and shakes on roofs.
21.09	Describe how to close up a valley using wood shingles and shakes.
21.10	Explain how to make roof projections watertight when using wood shakes and shingles.
21.11	Complete the cuts and install the main and hip ridge caps using wood shakes/shingles.
21.12	Demonstrate the techniques for installing other selected types of roofing materials.
22.0	Apply thermal and moisture protection--The student will be able to:
22.01	Research the requirements for insulation.
22.02	Identify the characteristics of various types of insulation material.
22.03	Calculate the required amounts of insulation for a structure.
22.04	Install selected insulation materials.
22.05	Describe the requirements for moisture control and ventilation.
22.06	Install selected vapor barriers.
22.07	Describe various methods of waterproofing.
22.08	Describe air infiltration control requirements.
22.09	Install selected building wraps.
23.0	Frame walls using cold-formed steel--The student will be able to:
23.01	Identify the components of a steel framing system.
23.02	Identify and select the tools and fasteners used in a steel framing system.
23.03	Identify applications for steel framing systems.
23.04	Demonstrate the ability to build back-to-back, box and L-headers.

23.05	Lay out and install a steel stud structural wall with openings to include bracing and blocking.
23.06	Lay out and install a steel stud non-structural wall with openings to include blocking and bracing.
24.0	Perform site-preparation and layout activities--The student will be able to:
24.01	Identify building layout from plans and specifications using math skills.
24.02	Set up and adjust a transit and builder's level over one point and establish lines over two points.
24.03	Erect batter boards and locate building lines.
24.04	Locate building line points on batter boards using a builder's level.
24.05	Locate building lines on a plot plan.
24.06	Square a building, using the 3-4-5-triangle method and the diagonal method.
25.0	Explain the importance of employability and entrepreneurship skills--The student will be able to:
25.01	Identify and demonstrate positive work behaviors needed to be employable.
25.02	Develop personal career plan that includes goals, objectives and strategies.
25.03	Examine licensing, certification and industry credentialing requirements.
25.04	Maintain a career portfolio to document knowledge, skills and experience.
25.05	Evaluate and compare employment opportunities that match career goals.
25.06	Identify and exhibit traits for retaining employment.
25.07	Identify opportunities and research requirements for career advancement.
25.08	Research the benefits of ongoing professional development.
25.09	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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

### **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 (if applicable)**

In PSAV 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: Mathematics 9, Language 9, and Reading 9. 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(7), 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(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

## **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 2  
**Program Type:** Career Preparatory  
**Career Cluster:** Architecture and Construction

**PSAV**

Program Number	C510200
CIP Number	0646020112
Grade Level	30, 31
Standard Length	600 Hours
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-2031 - Carpenters
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

**Purpose**

The purpose of this program is to prepare students for employment in the carpentry industry with a stress on basic carpentry skills. 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 cabinetmaking skills, as well as 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 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	SOC Code
A	BCV0122	Carpenter, Rough	CAB WOODWK @7 7G	450 Hours	47-2031
B	BCV0128	Carpenter	CARPENTRY @7 7G BLDG CONST @7 7G TEC CONSTR @7 7G	150 Hours	47-2031

## **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 concrete tests.
- 02.0 Lay foundations.
- 03.0 Construct vertical formwork.
- 04.0 Construct horizontal formwork.
- 05.0 Erect and properly align tilt-up wall panels.
- 06.0 Install drywall.
- 07.0 Install a suspended ceiling.
- 08.0 Interpret door and door hardware requirements based on plans and specifications.
- 09.0 Install windows and exterior doors.
- 10.0 Apply interior trim.
- 11.0 Lay out and construct an exterior stair system.
- 12.0 Apply exterior finishing.
- 13.0 Set up and install basic rigging and scaffolding.
- 14.0 Erect, plumb and brace a simple concrete form with reinforcement.
- 15.0 Explain and demonstrate how to place reinforcing bars in walls, columns, beams, girders, joists and slabs.
- 16.0 Explain the transport and placement of concrete.
- 17.0 Demonstrate an understanding of trenching and excavation.
- 18.0 Identify structural timber.
- 19.0 Use plans and specifications for form carpentry.
- 20.0 Explain or identify various forms.



Florida Department of Education  
Student Performance Standards

Program Title:      Carpentry 2  
PSAV Number:      C510200

<b>Course Number: BCV0122</b>	
<b>Occupational Completion Point: A</b>	
<b>Carpenter Rough – 450 Hours – SOC Code 47-2031</b>	
01.0	Perform concrete tests--The student will be able to:
01.01	Identify various types of cement and describe their uses.
01.02	Identify types and sizes of concrete aggregates.
01.03	Research types of concrete admixtures and describe their uses.
01.04	Research special types of concrete and describe their uses.
01.05	Calculate concrete volume requirements for rectangular, cylindrical, or other geometric structures using formulas, concrete tables and/or concrete calculators, as applicable.
01.06	Use concrete curing methods and materials.
01.07	Conduct concrete slump test.
01.08	Mix concrete using different aggregates and admixtures.
02.0	Lay foundations--The student will be able to:
02.01	Establish elevations.
02.02	Identify various types of footing and foundations.
02.03	Select the appropriate footing for a foundation.
02.04	Lay out and construct a selected footing and foundation using an established gridline.
02.05	Install templates, keyways and embedments.
02.06	Form and strip pier foundation forms and prepare for resetting at another location.
02.07	Identify the different classes of slabs-on-grade.

02.08	Identify edge forms and explain their purpose.
02.09	Construct and disassemble edge forms.
02.10	Install vapor barrier, reinforcement and control joints.
02.11	Establish finish grade and fill requirements.
03.0	Construct vertical formwork--The student will be able to:
03.01	Explain safety procedures associated with using concrete wall forms.
03.02	Identify the various types of concrete wall forms.
03.03	Identify the components of each type of vertical forming system.
03.04	Erect, plumb and brace a selected wall.
03.05	Recognize various types of manufactured forms.
03.06	State the differences in construction and use among different types of forms.
03.07	Erect, plumb and brace a column form.
03.08	Erect, plumb and brace a stair form.
03.09	Locate and install bulkheads and embedded forms.
04.0	Construct horizontal formwork--The student will be able to:
04.01	Identify the safety hazards associated with elevated deck formwork and explain how to eliminate them.
04.02	Identify the different types of elevated decks.
04.03	Identify the different types of flying form systems.
04.04	Identify different types of handset form systems.
04.05	Erect, plumb, brace and level different types of handset deck form systems.
04.06	Distinguish characteristics of joints: control, expansion and construction.
04.07	Install edge forms, blockouts, embedments and construction joints.
04.08	Identify typical bridge and culvert form systems.

05.0	Erect and properly align tilt-up wall panels--The student will be able to:
05.01	Describe the different processes used in installing tilt-up wall panels.
05.02	Explain the importance of the casting bed.
05.03	Identify and install the various types of lifting eyes used in forming tilt-up panels.
05.04	Identify the special rigging requirements for tilt-up wall panels.
05.05	Identify the different methods of forming tilt-up wall panels.
05.06	Demonstrate the different methods of forming tilt-up wall panels.
05.07	Prepare for the erection of tilt-up wall panels.
05.08	Install proper bracing for tilt-up wall panels.
05.09	Install embedments, blockouts, architectural finishes, lifting devices and reinforcing materials using a set of construction drawings.
05.10	Describe the final grouting procedure.
06.0	Install drywall --The student will be able to:
06.01	Identify the different types of drywall and their uses.
06.02	Select the type and thickness of drywall required for specific installations.
06.03	Select fasteners for drywall installation.
06.04	Explain the fastener schedules for different types of drywall installations.
06.05	Perform single-layer and multi-layer drywall installations using different types of fastening systems including nails, drywall screws and adhesives.
06.06	Install gypsum drywall on steel studs.
06.07	Explain how soundproofing is achieved in drywall installations.
06.08	Estimate material quantities for a drywall installation.
07.0	Install a suspended ceiling--The student will be able to:
07.01	Establish a level line.
07.02	Explain the common terms related to sound waves and acoustical ceiling materials.

07.03	Identify the different types of suspended ceilings.
07.04	Interpret plans related to ceiling layout.
07.05	Sketch the ceiling layout for a basic suspended ceiling.
07.06	Perform a material takeoff for a suspended ceiling.
07.07	Install selected suspended ceilings.
08.0	Interpret door and door hardware requirements based on plans and specifications--The student will be able to:
08.01	Identify various types of door jambs and frames and demonstrate the installation procedures for placing selected door jambs and frames in different types of interior partitions.
08.02	Identify different types of interior doors.
08.03	Identify different types of interior door hardware and demonstrate the installation procedures for selected types.
08.04	List and identify specific items included on a typical door schedule.
08.05	Explain the procedure for placing and hanging a specified door.
09.0	Install windows and exterior doors--The student will be able to:
09.01	Identify various types of fixed, sliding and swinging windows.
09.02	Identify the parts of a window installation.
09.03	State the requirements for a proper window installation.
09.04	Install a pre-hung window.
09.05	Identify the common types of exterior doors and explain how they are constructed.
09.06	Identify the parts of a door installation.
09.07	Identify the types of thresholds used with exterior doors.
09.08	Install a pre-hung exterior door.
09.09	Identify the various types of locksets used on exterior doors and explain how they are installed.
09.10	Install a lockset.
10.0	Apply interior trim--The student will be able to:

10.01	Identify the different types of standard moldings and describe their uses.
10.02	Make square and miter cuts using a saw buck or power miter saw.
10.03	Select and properly use fasteners to install trim.
10.04	Install interior trim including door, window, base and ceiling trim.
10.05	Estimate the quantities of different trim materials required for selected rooms.
11.0	Lay out and construct an exterior stair system--The student will be able to:
11.01	Identify the types of exterior stair systems.
11.02	Identify the parts of an exterior stair system.
11.03	Calculate the number of treads and risers for an exterior stair system.
11.04	Lay out, cut and assemble an exterior stair system.
12.0	Apply exterior finishing--The student will be able to:
12.01	Describe the purpose of wall insulation and flashing.
12.02	Install selected common cornices.
12.03	Demonstrate lap and panel siding estimating methods.
12.04	Describe the types and applications of common wood siding.
12.05	Describe fiber-cement siding and its uses.
12.06	Describe the types and styles of vinyl and metal siding.
12.07	Describe the types and applications of stucco and masonry veneer finishes.
12.08	Describe the types and applications of special exterior finish systems.
12.09	Install three types of siding commonly used in your area.
13.0	Set up and install basic rigging and scaffolding--The student will be able to:
13.01	Identify and explain rigging equipment.
13.02	Inspect rigging equipment, following safety precautions.

13.03	Estimate size, weight and center of gravity.
13.04	Tie knots.
13.05	Identify and explain types of cranes.
13.06	Rig and move materials and equipment, following safety precautions.
13.07	Set up and install scaffolds, following safety precautions.
13.08	Inspect various types of ladders and scaffolds, following safety precautions.
14.0	Erect, plumb and brace a simple concrete form with reinforcement--The student will be able to:
14.01	Identify the properties of cement.
14.02	Describe the composition of concrete.
14.03	Estimate volumes of concrete.
14.04	Identify types of concrete reinforcement materials and describe their uses.
14.05	Identify various types of footings and explain their uses.
14.06	Identify the parts of various types of forms.
14.07	Explain the safety procedures associated with the construction and use of concrete forms.
15.0	Explain and demonstrate how to place reinforcing bars in walls, columns, beams, girders, joists and slabs--The student will be able to:
15.01	Describe the applications of reinforcing bars, the uses of reinforced structural concrete and the basic processes involved in placing reinforcing bars.
15.02	Recognize and identify the bar bends standardized by the American Concrete Institution (ACI).
15.03	Read and interpret bar lists and describe the information found on a bar list.
15.04	List the types of ties used in securing reinforcing bars.
15.05	State the tolerances allowed in the fabrication of reinforcing bars.
15.06	Demonstrate the proper use of common ties for reinforcing bars.
15.07	Describe methods by which reinforcing bars may be cut and bent in the field.
15.08	Use the tools and equipment needed for installing reinforcing bars.

15.09	Safely use selected tools and equipment to cut, bend and install reinforcing materials.
15.10	Explain the necessity of concrete cover in placing reinforcing bars.
15.11	Identify lapped splices.
16.0	Explain the transport and placement of concrete--The student will be able to:
16.01	List various types of equipment used to transport and place concrete.
16.02	Describe the factors that contribute to the quality of concrete placement.
16.03	Demonstrate the correct methods for placing and consolidating concrete into forms.
16.04	Use a screed to strike off and level concrete to the proper grade in a form.
16.05	Use tools for placing, floating and finishing concrete.
16.06	Determine when conditions permit the concrete finishing operation to start.
16.07	Name the factors that affect the curing of concrete and describe the methods used to achieve proper curing.
16.08	Properly care for and safely use hand and power tools used when working with concrete.
17.0	Demonstrate an understanding of trenching and excavation--The student will be able to:
17.01	Identify the different types, bearing capacities and classifications of soils.
17.02	Identify ways to increase soil density.
17.03	State the purpose of soil density (compaction) tests.
17.04	Explain the safety considerations for trenches and deep excavations.
17.05	Identify and describe groundwater mitigation methods.
17.06	Identify and describe rock mitigation techniques.

**Course Number: BCV0128**  
**Occupational Completion Point: B**  
**Carpenter – 150 Hours – SOC Code 47-2031**

18.0	Identify structural timber--The student will be able to:
18.01	Identify structural-timber components and heavy structural timber.

19.0	Use plans and specifications for form carpentry--The student will be able to:
19.01	Read an architect's scale for form carpentry job.
19.02	Determine dimensions from plans.
19.03	Relate information on plans and specifications to real parts, locations, hardware and fasteners.
20.0	Explain or identify various forms--The student will be able to:
20.01	Identify styles of footings.
20.02	Explain method for setting a pier footing form.
20.03	Explain how to strip a form for reuse.
20.04	Explain edge forms for a floor with or without foundation walls and for a stoop.
20.05	Explain various types of curb and gutter forms.
20.06	Identify various types of beams, columns and slabs with various form systems (Burke, Symons, plywood and 2'x 4').
20.07	Identify and explain the different types and uses of flying forms for decks and shear walls.
20.08	Explain concrete pressure and its implications for form work routines.
20.09	Identify form-work accessories such as snap-ties, wedges, pigs-feet, whalers, and stiffbacks for forming walls, beams and columns with plywood and 2'x 4' material.



## **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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

SkillsUSA is the appropriate 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 (if applicable)**

In PSAV 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: Mathematics 9, Language 9, and Reading 9. 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(7), 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(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

## **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  
**Program Type:** Career Preparatory  
**Career Cluster:** Architecture and Construction

**PSAV**

Program Number	I460103
CIP Number	0646010106
Grade Level	30,31
Standard Length	500 Hours
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-2044 - Tile and Marble Setters
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

**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).

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	SOC Code
A	BCV0392	Hard Tile Setter 1	TEC CONSTR ¶ 7 ¶ G BLDG CONST ¶ 7 ¶ G	250 Hours	47-2044
	BCV0393	Hard Tile Setter 2			
	BCV0392	Hard Tile Setter 1	TILE SET 7G	250 Hours	47-2044
	BCV0393	Hard Tile Setter 2			

## **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  
PSAV Number: I460103

<b>Course Number: BCV0392</b>	
<b>Occupational Completion Point:</b>	
<b>Hard Tile Setter 1 – 250 Hours – SOC Code 47-2044</b>	
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: BCV0393**  
**Occupational Completion Point: A**  
**Hard Tile Setter 2 – 250 Hours – SOC Code 47-2044**

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.
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.

## **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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

SkillsUSA is the intercultural 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 (if applicable)**

In PSAV 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: Mathematics 9, Language 9, and Reading 9. 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(7), 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(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

## **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

**PSAV**

Program Number	I460202
CIP Number	0646020105
Grade Level	30, 31
Standard Length	1200 Hours
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-3012 – Helpers--Carpenters 47-2031- Carpenters
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

**Purpose**

The purpose of this program is to prepare students for employment in the carpentry industry with a stress on basic carpentry skills. 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 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	SOC Code
A	BCV0107	Carpenter Helper	CAB WOODWK @7 7G	300 Hours	47-3012
B	BCV0111	Trim And Finish Carpenter	CARPENTRY @7 7G	300 Hours	47-2031
C	BCV0122	Carpenter, Rough	BLDG CONST @7 7G	450 Hours	47-2031
D	BCV0128	Carpenter	TEC CONSTR @7 7G	150 Hours	47-2031



## **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 carpentry profession.
- 03.0 Demonstrate mathematics knowledge and skills relevant to the carpentry field.
- 04.0 Create basic construction drawings and/or sketches.
- 05.0 Recommend appropriate building materials for specific scenarios.
- 06.0 Select appropriate fasteners and hardware for specific scenarios.
- 07.0 Apply occupational safety skills.
- 08.0 Select and use hand and power tools relevant to the carpentry profession.
- 09.0 Fasten stock and joints.
- 10.0 Read and design construction documents.
- 11.0 Install cabinets and components.
- 12.0 Investigate sustainability issues related to the carpentry professions.
- 13.0 Identify and describe interior and exterior doors (wood and/or metal).
- 14.0 Install trim and finish carpentry using plans and specifications.
- 15.0 Cut and install framing members for a floor (wood and/or metal).
- 16.0 Cut and install a wall and partition framing (wood and/or metal).
- 17.0 Install an interior wall and ceiling materials.
- 18.0 Lay out and construct an interior-stair system.
- 19.0 Comply with hurricane codes.
- 20.0 Frame a roof.
- 21.0 Apply roofing applications.
- 22.0 Apply thermal and moisture protection.
- 23.0 Frame walls using cold-formed steel.
- 24.0 Perform site-preparation and layout activities.
- 25.0 Explain the importance of employability and entrepreneurship skills.
- 26.0 Perform concrete tests.
- 27.0 Lay foundations.
- 28.0 Construct vertical formwork.
- 29.0 Construct horizontal formwork.
- 30.0 Erect and properly align tilt-up wall panels.
- 31.0 Install drywall.
- 32.0 Install a suspended ceiling.
- 33.0 Interpret door and door hardware requirements based on plans and specifications.
- 34.0 Install windows and exterior doors.
- 35.0 Apply interior trim.
- 36.0 Lay out and construct an exterior stair system.
- 37.0 Apply exterior finishing.

- 38.0 Set up and install basic rigging and scaffolding.
- 39.0 Erect, plumb and brace a simple concrete form with reinforcement.
- 40.0 Explain and demonstrate how to place reinforcing bars in walls, columns, beams, girders, joists and slabs.
- 41.0 Explain the transport and placement of concrete.
- 42.0 Demonstrate an understanding of trenching and excavation.
- 43.0 Identify structural timber.
- 44.0 Use plans and specifications for form carpentry.
- 45.0 Explain or identify various forms.

Florida Department of Education  
Student Performance Standards

Program Title:      Carpentry  
PSAV Number:      I460202

<b>Course Number: BCV0107</b>	
<b>Occupational Completion Point: A</b>	
<b>Carpenter Helper – 300 Hours – SOC Code 47-3012</b>	
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 and report safety hazards.
01.06	Demonstrate the inspection, use and care of personal protective equipment (PPE).
02.0	Utilize manual and power tools relevant to the carpentry 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 carpentry field--The student will be able to:
03.01	Apply geometry and algebra skills to solve math problems related to carpentry with and without a calculator.
03.02	Demonstrate knowledge of arithmetic operations.
03.03	Solve problems for distance, perimeter, area and volume.

03.04	Analyze and apply data and measurements to solve problems and interpret documents.
03.05	Construct charts/tables/graphs using functions and data.
04.0	Create basic construction drawings and/or sketches--The student will be able to:
04.01	Recognize and identify basic construction drawing terms, components and symbols.
04.02	Relate information on construction drawings to actual locations on the print.
04.03	Recognize different classifications of construction drawings.
04.04	Interpret and use drawing dimensions and architectural scales.
05.0	Recommend appropriate building materials for specific scenarios--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.
05.04	Identify defects and blemishes that affect the durability and strength of lumber.
05.05	Explain the effects of temperature extremes, chemical reaction and moisture content on building materials.
05.06	Explain the uses of various types of engineered lumber.
06.0	Select appropriate fasteners and hardware for specific scenarios--The student will be able to:
06.01	Identify the fasteners commonly used in carpentry.
06.02	Identify the hardware commonly used in carpentry.
07.0	Apply occupational safety skills--The student will be able to:
07.01	Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200)
07.02	Explain the purpose of the Occupational Safety and Health Administration (OSHA).
07.03	Identify health-related problems that may result from exposure to hazardous materials.
07.04	Describe the proper precautions for handling hazardous materials.
07.05	Explain eligibility and the procedures for obtaining worker's compensation.

07.06	Explain the importance of complying with the Americans with Disabilities Act (ADA) requirements.
08.0	Select and use hand and power tools relevant to the carpentry profession--The student will be able to:
08.01	Identify the hand tools commonly used by carpenters and describe their uses.
08.02	Use hand tools in a safe and appropriate manner.
08.03	State the general safety rules for operating all power tools, regardless of type.
08.04	State the general rules for properly maintaining all power tools, regardless of type.
08.05	Identify the portable power tools commonly used by carpenters and describe their uses.
08.06	Use portable power tools in a safe and appropriate manner.
09.0	Fasten stock and joints--The student will be able to:
09.01	Identify types of glues and fasteners and describe their applications.
09.02	Fasten stock with glue and clamps.
09.03	Fasten stock and joints with appropriate fasteners such as nails, staples, screws and bolts.
09.04	Fill and finish nail and screw holes with fillers and plugs.
09.05	Glue and clamp stock using various techniques.
10.0	Read and design construction documents--The student will be able to:
10.01	Explain the types of drawings usually included in a set of plans and list the information found on each type.
10.02	Identify the different types of lines used on construction drawings.
10.03	Identify selected abbreviations commonly used on plans.
10.04	Read and interpret plans, elevations, schedules, sections and details contained in basic construction drawings.
10.05	State the purpose of written specifications.
10.06	Identify and describe the parts of a specification.
10.07	Conduct quantity takeoff for materials.
10.08	Design millwork and draw details in construction documents for a given scenario.

11.0	Install cabinets and components--The student will be able to:
11.01	Install hardware such as hinges, catches, pulls, knobs and guides on assembled cabinets.
11.02	Install fasteners.
11.03	Install drawers.
11.04	Install various types of doors including overlay, lipped and flush.
11.05	Install adjustable shelving.
11.06	Install glass panels and metal grills.
11.07	Install specialty hardware such as a lazy Susan, wire racks and "pull-outs".
11.08	Install sliding doors and track.
12.0	Investigate sustainability issues related to the carpentry profession--The student will be able to:
12.01	Describe the impact of the construction industry on the natural environment.
12.02	Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.
12.03	Recommend sustainable alternatives to conventional carpentry practices.
12.04	Identify specific practices that can lessen adverse impacts on the environment.

<b>Course Number: BCV0111</b>	
<b>Occupational Completion Point: B</b>	
<b>Trim &amp; Finish Carpenter – 300 Hours – SOC Code 47-2031</b>	
13.0	Identify and describe interior and exterior doors (wood and/or metal)--The student will be able to:
13.01	Identify the types and parts of door systems.
13.02	Identify door jamb components.
13.03	Identify door hardware.
14.0	Install trim and finish carpentry using plans and specifications--The student will be able to:
14.01	Read an architect's scale to determine measurements for a trim and finish carpentry job.
14.02	Cut and apply trim such as crown molding, baseboard, door and window molding, wainscoting and chair rail.

15.0	Cut and install framing members for a floor (wood and/or metal)--The student will be able to:
15.01	Identify and describe floor-framing members including subfloor.
15.02	Identify supports for structures (e.g., sills, columns, beams and girders).
15.03	Identify various types of joists and openings, including joists for a cantilevered floor.
15.04	Identify various types of bridging.
15.05	Identify various types of subfloors, applying fastening techniques.
16.0	Cut and install a wall and partition framing (wood and/or metal)--The student will be able to:
16.01	Identify framing members used in wall and partition construction.
16.02	Lay out wall lines and partition locations on a floor.
16.03	Lay out walls for studs, doors and windows.
16.04	Identify studs, trimmers, cripples, headers and fire stops to length.
16.05	Identify T's, corners and headers.
16.06	Identify wall layout.
16.07	Identify wall sheathing and/or diagonal bracing.
16.08	Identify and describe insulation materials and a vapor barrier.
17.0	Install an interior wall and ceiling materials--The student will be able to:
17.01	Identify and describe furring strips.
17.02	Identify and describe drywall materials.
17.03	Identify paneling and trim.
17.04	Identify ceiling materials and systems.
18.0	Lay out and construct an interior-stair system--The student will be able to:
18.01	Identify the types and styles of interior-stair systems.
18.02	Identify the components of an interior-stair system.



18.03	Calculate the number of risers and treads for an interior-stair system.
18.04	Describe an interior-stair system (rough and finish).
19.0	Comply with hurricane codes--the student will be able to:
19.01	Install hurricane anchors.
19.02	Install hurricane clips.
19.03	Install hurricane straps.
19.04	Explain the purpose and importance of the codes relating to hurricanes.
20.0	Frame a roof--The student will be able to:
20.01	Understand the terms associated with roof framing.
20.02	Identify the roof framing members used in gable and hip roofs.
20.03	Identify the methods used to calculate the length of a rafter.
20.04	Identify the various types of trusses used in roof framing.
20.05	Use a rafter framing square, speed square and calculator in laying out a roof.
20.06	Identify various types of sheathing used in roof construction.
20.07	Frame a gable roof with vent openings.
20.08	Frame a roof opening.
20.09	Erect a gable roof using trusses.
20.10	Estimate the materials used in framing and sheathing a roof.
21.0	Apply roofing applications--The student will be able to:
21.01	Identify the materials and methods used in roofing.
21.02	Explain the safety requirements for roof jobs.
21.03	Install fiberglass shingles on gable and hip roofs.
21.04	Close up a valley using fiberglass shingles.

21.05	Explain how to make various roof projections watertight when using fiberglass shingles.
21.06	Complete the proper cuts and install the main and hip ridge caps using fiberglass shingles.
21.07	Lay out, cut and install a cricket or saddle.
21.08	Install wood shingles and shakes on roofs.
21.09	Describe how to close up a valley using wood shingles and shakes.
21.10	Explain how to make roof projections watertight when using wood shakes and shingles.
21.11	Complete the cuts and install the main and hip ridge caps using wood shakes/shingles.
21.12	Demonstrate the techniques for installing other selected types of roofing materials.
22.0	Apply thermal and moisture protection--The student will be able to:
22.01	Research the requirements for insulation.
22.02	Identify the characteristics of various types of insulation material.
22.03	Calculate the required amounts of insulation for a structure.
22.04	Install selected insulation materials.
22.05	Describe the requirements for moisture control and ventilation.
22.06	Install selected vapor barriers.
22.07	Describe various methods of waterproofing.
22.08	Describe air infiltration control requirements.
22.09	Install selected building wraps.
23.0	Frame walls using cold-formed steel--The student will be able to:
23.01	Identify the components of a steel framing system.
23.02	Identify and select the tools and fasteners used in a steel framing system.
23.03	Identify applications for steel framing systems.
23.04	Demonstrate the ability to build back-to-back, box and L-headers.

23.05	Lay out and install a steel stud structural wall with openings to include bracing and blocking.
23.06	Lay out and install a steel stud non-structural wall with openings to include blocking and bracing.
24.0	Perform site-preparation and layout activities--The student will be able to:
24.01	Identify building layout from plans and specifications using math skills.
24.02	Set up and adjust a transit and builder's level over one point and establish lines over two points.
24.03	Erect batter boards and locate building lines.
24.04	Locate building line points on batter boards using a builder's level.
24.05	Locate building lines on a plot plan.
24.06	Square a building, using the 3-4-5-triangle method and the diagonal method.
25.0	Explain the importance of employability and entrepreneurship skills--The student will be able to:
25.01	Identify and demonstrate positive work behaviors needed to be employable.
25.02	Develop personal career plan that includes goals, objectives and strategies.
25.03	Examine licensing, certification and industry credentialing requirements.
25.04	Maintain a career portfolio to document knowledge, skills and experience.
25.05	Evaluate and compare employment opportunities that match career goals.
25.06	Identify and exhibit traits for retaining employment.
25.07	Identify opportunities and research requirements for career advancement.
25.08	Research the benefits of ongoing professional development.
25.09	Examine and describe entrepreneurship opportunities as a career planning option.

**Course Number: BCV0122**  
**Occupational Completion Point: C**  
**Carpenter Rough – 450 Hours – SOC Code 47-2031**

26.0	Perform concrete tests--The student will be able to:
26.01	Identify various types of cement and describe their uses.

26.02	Identify types and sizes of concrete aggregates.
26.03	Research types of concrete admixtures and describe their uses.
26.04	Research special types of concrete and describe their uses.
26.05	Calculate concrete volume requirements for rectangular, cylindrical, or other geometric structures using formulas, concrete tables and/or concrete calculators, as applicable.
26.06	Use concrete curing methods and materials.
26.07	Conduct concrete slump test.
26.08	Mix concrete using different aggregates and admixtures.
26.09	Collect concrete samples using a test cylinder
27.0	Lay foundations--The student will be able to:
27.01	Establish elevations.
27.02	Identify various types of footing and foundations.
27.03	Select the appropriate footing for a foundation.
27.04	Lay out and construct a selected footing and foundation using an established gridline.
27.05	Install templates, keyways and embedments.
27.06	Form and strip pier foundation forms and prepare for resetting at another location.
27.07	Identify the different classes of slabs-on-grade.
27.08	Identify edge forms and explain their purpose.
27.09	Construct and disassemble edge forms.
27.10	Install vapor barrier, reinforcement and control joints.
27.11	Establish finish grade and fill requirements.
28.0	Construct vertical formwork--The student will be able to:
28.01	Explain safety procedures associated with using concrete wall forms.
28.02	Identify the various types of concrete wall forms.

28.03	Identify the components of each type of vertical forming system.
28.04	Erect, plumb and brace a selected wall.
28.05	Recognize various types of manufactured forms.
28.06	State the differences in construction and use among different types of forms.
28.07	Erect, plumb and brace a column form.
28.08	Erect, plumb and brace a stair form.
28.09	Locate and install bulkheads and embedded forms.
29.0	Construct horizontal formwork--The student will be able to:
29.01	Identify the safety hazards associated with elevated deck formwork and explain how to eliminate them.
29.02	Identify the different types of elevated decks.
29.03	Identify the different types of flying form systems.
29.04	Identify different types of handset form systems.
29.05	Erect, plumb, brace and level different types of handset deck form systems.
29.06	Install edge forms, blockouts, embedments and construction joints.
29.07	Distinguish characteristics of joints: control, expansion and construction.
29.08	Identify typical bridge and culvert form systems.
30.0	Erect and properly align tilt-up wall panels--The student will be able to:
30.01	Describe the different processes used in installing tilt-up wall panels.
30.02	Explain the importance of the casting bed.
30.03	Identify and install the various types of lifting eyes used in forming tilt-up panels.
30.04	Identify the special rigging requirements for tilt-up wall panels.
30.05	Identify the different methods of forming tilt-up wall panels.
30.06	Demonstrate the different methods of forming tilt-up wall panels.

30.07	Prepare for the erection of tilt-up wall panels.
30.08	Install proper bracing for tilt-up wall panels.
30.09	Install embedments, blockouts, architectural finishes, lifting devices and reinforcing materials using a set of construction drawings.
30.10	Describe the final grouting procedure.
31.0	Install drywall --The student will be able to:
31.01	Identify the different types of drywall and their uses.
31.02	Select the type and thickness of drywall required for specific installations.
31.03	Select fasteners for drywall installation.
31.04	Explain the fastener schedules for different types of drywall installations.
31.05	Perform single-layer and multi-layer drywall installations using different types of fastening systems including nails, drywall screws and adhesives.
31.06	Install gypsum drywall on steel studs.
31.07	Explain how soundproofing is achieved in drywall installations.
31.08	Estimate material quantities for a drywall installation.
32.0	Install a suspended ceiling--The student will be able to:
32.01	Establish a level line.
32.02	Explain the common terms related to sound waves and acoustical ceiling materials.
32.03	Identify the different types of suspended ceilings.
32.04	Interpret plans related to ceiling layout.
32.05	Sketch the ceiling layout for a basic suspended ceiling.
32.06	Perform a material takeoff for a suspended ceiling.
32.07	Install selected suspended ceilings.
33.0	Interpret door and door hardware requirements based on plans and specifications--The student will be able to:
33.01	Identify various types of door jambs and frames and demonstrate the installation procedures for placing selected door jambs and frames in different types of interior partitions.

33.02	Identify different types of interior doors.
33.03	Identify different types of interior door hardware and demonstrate the installation procedures for selected types.
33.04	List and identify specific items included on a typical door schedule.
33.05	Explain the procedure for placing and hanging a specified door.
34.0	Install windows and exterior doors--The student will be able to:
34.01	Identify various types of fixed, sliding and swinging windows.
34.02	Identify the parts of a window installation.
34.03	State the requirements for a proper window installation.
34.04	Install a pre-hung window.
34.05	Identify the common types of exterior doors and explain how they are constructed.
34.06	Identify the parts of a door installation.
34.07	Identify the types of thresholds used with exterior doors.
34.08	Install a pre-hung exterior door.
34.09	Identify the various types of locksets used on exterior doors and explain how they are installed.
34.10	Install a lockset.
35.0	Apply interior trim--The student will be able to:
35.01	Identify the different types of standard moldings and describe their uses.
35.02	Make square and miter cuts using a saw buck or power miter saw.
35.03	Select and properly use fasteners to install trim.
35.04	Install interior trim including door, window, base and ceiling trim.
35.05	Estimate the quantities of different trim materials required for selected rooms.
36.0	Lay out and construct an exterior stair system--The student will be able to:
36.01	Identify the types of exterior stair systems.

36.02	Identify the parts of an exterior stair system.
36.03	Calculate the number of treads and risers for an exterior stair system.
36.04	Lay out, cut and assemble an exterior stair system.
37.0	Apply exterior finishing--The student will be able to:
37.01	Describe the purpose of wall insulation and flashing.
37.02	Install selected common cornices.
37.03	Demonstrate lap and panel siding estimating methods.
37.04	Describe the types and applications of common wood siding.
37.05	Describe fiber-cement siding and its uses.
37.06	Describe the types and styles of vinyl and metal siding.
37.07	Describe the types and applications of stucco and masonry veneer finishes.
37.08	Describe the types and applications of special exterior finish systems.
37.09	Install three types of siding commonly used in your area.
38.0	Set up and install basic rigging and scaffolding--The student will be able to:
38.01	Identify and explain rigging equipment.
38.02	Inspect rigging equipment, following safety precautions.
38.03	Estimate size, weight and center of gravity.
38.04	Tie knots.
38.05	Identify and explain types of cranes.
38.06	Rig and move materials and equipment, following safety precautions.
38.07	Set up and install scaffolds, following safety precautions.
38.08	Inspect various types of ladders and scaffolds, following safety precautions.
39.0	Erect, plumb and brace a simple concrete form with reinforcement--The student will be able to:



39.01	Identify the properties of cement.
39.02	Describe the composition of concrete.
39.03	Estimate volumes of concrete.
39.04	Identify types of concrete reinforcement materials and describe their uses.
39.05	Identify various types of footings and explain their uses.
39.06	Identify the parts of various types of forms.
39.07	Explain the safety procedures associated with the construction and use of concrete forms.
40.0	Explain and demonstrate how to place reinforcing bars in walls, columns, beams, girders, joists and slabs--The student will be able to:
40.01	Describe the applications of reinforcing bars, the uses of reinforced structural concrete and the basic processes involved in placing reinforcing bars.
40.02	Recognize and identify the bar bends standardized by the American Concrete Institution (ACI).
40.03	Read and interpret bar lists and describe the information found on a bar list.
40.04	List the types of ties used in securing reinforcing bars.
40.05	State the tolerances allowed in the fabrication of reinforcing bars.
40.06	Demonstrate the proper use of common ties for reinforcing bars.
40.07	Describe methods by which reinforcing bars may be cut and bent in the field.
40.08	Use the tools and equipment needed for installing reinforcing bars.
40.09	Safely use selected tools and equipment to cut, bend and install reinforcing materials.
40.10	Explain the necessity of concrete cover in placing reinforcing bars.
40.11	Identify lapped splices.
41.0	Explain the transport and placement of concrete--The student will be able to:
41.01	List various types of equipment used to transport and place concrete.
41.02	Describe the factors that contribute to the quality of concrete placement.
41.03	Demonstrate the correct methods for placing and consolidating concrete into forms.

41.04	Use a screed to strike off and level concrete to the proper grade in a form.
41.05	Use tools for placing, floating and finishing concrete.
41.06	Determine when conditions permit the concrete finishing operation to start.
41.07	Name the factors that affect the curing of concrete and describe the methods used to achieve proper curing.
41.08	Properly care for and safely use hand and power tools used when working with concrete.
42.0	Demonstrate an understanding of trenching and excavation--The student will be able to:
42.01	Identify the different types, bearing capacities and classifications of soils.
42.02	Identify ways to increase soil density.
42.03	State the purpose of soil density (compaction) tests.
42.04	Explain the safety considerations for trenches and deep excavations.
42.05	Identify and describe groundwater mitigation methods.
42.06	Identify and describe rock mitigation techniques.

**Course Number: BCV0128**  
**Occupational Completion Point: D**  
**Carpenter – 150 Hours – SOC Code 47-2031**

43.0	Identify structural timber--The student will be able to:
43.01	Identify structural-timber components and heavy structural timber.
44.0	Use plans and specifications for form carpentry--The student will be able to:
44.01	Read an architect's scale for form carpentry job.
44.02	Determine dimensions from plans.
44.03	Relate information on plans and specifications to real parts, locations, hardware and fasteners.
45.0	Explain or identify various forms--The student will be able to:
45.01	Identify styles of footings.
45.02	Explain method for setting a pier footing form.

45.03	Explain how to strip a form for reuse.
45.04	Explain edge forms for a floor with or without foundation walls and for a stoop.
45.05	Explain various types of curb and gutter forms.
45.06	Identify various types of beams, columns and slabs with various form systems (Burke, Symons, plywood and 2'x 4').
45.07	Identify and explain the different types and uses of flying forms for decks and shear walls.
45.08	Explain concrete pressure and its implications for form work routines.
45.09	Identify form-work accessories such as snap-ties, wedges, pigs-feet, whalers, and stiffbacks for forming walls, beams and columns with plywood and 2'x 4' material.

## **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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

### **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 (if applicable)**

In PSAV 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: Mathematics 9, Language 9, and Reading 9. 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(7), 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(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

## **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

**PSAV**

Program Number	I460312
CIP Number	0646030202
Grade Level	30,31
Standard Length	1200 Hours
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-3013 - Helpers--Electricians 47-2111 - Electricians
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

**Purpose**

The purpose of this program is to prepare students for employment or advanced training in a variety of construction electrical 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	SOC Code
A	BCV0603	Electrician Helper	ELECTRICAL @7 7G IND ENGR 7G TEC ED 1@2	300 Hours	47-3013
B	BCV0640	Residential Electrician	ELECTRICAL @7 7G	450 Hours	47-2111
C	BCV0652	Commercial Electrician		450 Hours	47-2111

## **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 science knowledge and skills related to electrical principles.
- 10.0 Demonstrate proficiency in electrical math problems and skills.
- 11.0 Demonstrate 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  
PSAV Number: I460312

<b>Course Number: BCV0603</b>	
<b>Occupational Completion Point: A</b>	
<b>Electrician Helper – 300 Hours – SOC Code 47-3013</b>	
01.0	Explain the importance of health, safety, environmental stewardship and related regulatory compliance--The student will be able to:
01.01	Clean the work area and maintain it in a safe condition.
01.02	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.03	Identify and operate workplace-safety electrical devices.
01.04	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.
01.05	Explain emergency procedures to follow in response to workplace accidents.
01.06	Create a disaster and/or emergency response plan for specific incidences.
01.07	Explain the importance of CPR (cardiopulmonary resuscitation) and first aid.
01.08	Describe "Right-to-Know" 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, materials and wires to complete a job.
02.02	Drill holes in metal, wood and concrete for electrical wiring.
02.03	Lay out electrical devices, complying with regulations.
02.04	Install the following, complying with the appropriate local, state or national electric codes: <ul style="list-style-type: none"> <li>a. Conductors and cable</li> <li>b. Standard outlets and switch boxes</li> <li>c. Cord connections on equipment</li> <li>d. Cords switches, receptacles and dimmers, including a single-pole switched lighting circuit, a three-way switched lighting circuit and a four-way combination circuit</li> </ul>
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 a series, series-parallel and parallel circuit.
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 and insulators.
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/graphs using functions and data.
05.0	Demonstrate an understanding of basic electricity--The student will be able to:
05.01	Explain the principles of electromagnetism.
05.02	Explain the magnetic properties of circuits and devices.
05.03	Relate electricity to the nature of matter.
05.04	Describe various ways that electricity is produced.
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 AC theory and solve related mathematical problems using appropriate test equipment.
07.04	Solve math-related problems from measurements on training aids. (Optional)
08.0	Demonstrate further understanding of electricity--The student will be able to:
08.01	Explain molecular action as a result of temperature extremes, chemical reaction and moisture content.
08.02	Explain how voltage is produced by chemical, mechanical, thermal, photoelectric and piezo electric means.
08.03	Identify electrical symbols in construction documents.
09.0	Demonstrate science knowledge and skills related to electrical principles--The student will be able to:
09.01	Discuss the role of creativity in constructing scientific questions, methods and explanations.
09.02	Formulate scientifically investigable questions, construct investigations, collect and evaluate data and develop scientific recommendations based on findings.

**Course Number: BCV0640**  
**Occupational Completion Point: B**  
**Residential Electrician – 450 Hours -- SOC Code 47-2111**

10.0	Demonstrate proficiency in electrical math problems and skills--The student will be able to:
10.01	Calculate wiring costs.
10.02	Draw an industrial electrical-wiring plan.
10.03	Describe the use of high-voltage test equipment.
10.04	Describe how to test insulation.
10.05	Describe how to balance a load.
10.06	Use electrical related math skills.
11.0	Demonstrate 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	Apply the principles of transformers to AC circuits.
11.04	Identify the properties of an AC signal.

11.05	Identify AC sources.
11.06	Analyze and apply the principles of transformers to AC circuits.
11.07	Analyze polyphase circuits.
11.08	Install a simple polyphase circuit.
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 research requirements for career advancement.
12.08	Research 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	Draw a residential wiring plan, using electrical-wiring symbols.
13.03	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 or national electric codes.
13.04	Identify, install and wire a duplex- receptacle-outlet circuit, a split-circuit duplex-receptacle-outlet circuit and a special-purpose receptacle-outlet circuit according to the specifications, complying with the appropriate local, state or 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 equipment.

14.04	Install the following, complying with the appropriate local, state, or national electric codes: a. Service-entrance main panel b. Service-entrance meter base c. Alarm system/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 -- SOC Code 47-2111**

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, materials and wires to complete a job.
15.04	Install the following according to the plan and specifications, complying with appropriate electric codes: a. Wire mold b. Conduit, duct and raceway systems c. Conductors in a conduit
15.05	Describe the difference between a residential and a commercial lighting circuit.
15.06	Construct control circuits from schematics.
15.07	Describe high-voltage (over 600V) wiring requirements.
15.08	Demonstrate knowledge of installing wiring in hazardous areas.
15.09	Explain a commercial three-phase receptacle circuit and an emergency-lighting system.
15.10	Explain commercial-service-entrance requirements.
16.0	Demonstrate specialized electrical skills--The student will be able to:
16.01	Explain solid-state control devices.
16.02	Explain data cable installation according to the plan and specifications.

## **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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

### **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 (if applicable)**

In PSAV 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: Mathematics 9, Language 9, and Reading 9. 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(7), 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(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

## **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

**PSAV**

Program Number	I460314
CIP Number	0646030204
Grade Level	30,31
Standard Length	1500 Hours
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-3013 – Helpers - Electricians 47-2111 - Electricians
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

**Purpose**

The purpose of this program is to prepare students for employment or advanced training in a variety of construction electrical 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	SOC Code
A	BCV0603	Electrician Helper	ELECTRICAL @7 7G IND ENGR 7G TEC ED 1@2	300 Hours	47-3013
B	BCV0640	Residential Electrician	ELECTRICAL @7 7G	450 Hours	47-2111
C	BCV0652	Commercial Electrician		450 Hours	47-2111
D	BCV0667	Industrial Electrician		300 Hours	47-2111

## **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 science knowledge and skills related to electrical principles.
- 10.0 Demonstrate proficiency in electrical math problems and skills.
- 11.0 Demonstrate 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 AC and DC motors.
- 19.0 Demonstrate competency in electrical and electronic control circuits and equipment.

Florida Department of Education  
Student Performance Standards

Program Title: Electrician  
PSAV Number: I460314

<b>Course Number: BCV0603</b>	
<b>Occupational Completion Point: A</b>	
<b>Electrician Helper – 300 Hours – SOC Code 47-3013</b>	
01.0	Explain the importance of health, safety, environmental stewardship and related regulatory compliance--The student will be able to:
01.01	Clean the work area and maintain it in a safe condition.
01.02	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.03	Identify and operate workplace-safety electrical devices.
01.04	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.
01.05	Explain emergency procedures to follow in response to workplace accidents.
01.06	Create a disaster and/or emergency response plan for specific incidences.
01.07	Explain the importance of CPR (cardiopulmonary resuscitation) and first aid.
01.08	Describe "Right-to-Know" 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, materials and wires to complete a job.
02.02	Drill holes in metal, wood and concrete for electrical wiring.
02.03	Lay out electrical devices, complying with regulations.
02.04	Install the following, complying with the appropriate local, state or national electric codes: <ul style="list-style-type: none"> <li>a. Conductors and cable</li> <li>b. Standard outlets and switch boxes</li> <li>c. Cord connections on equipment</li> <li>d. Cords switches, receptacles and dimmers, including a single-pole switched lighting circuit, a three-way switched lighting circuit and a four-way combination circuit</li> </ul>

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 a series, series-parallel and parallel circuit.
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 and insulators.
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/graphs using functions and data.
05.0	Demonstrate an understanding of basic electricity--The student will be able to:
05.01	Explain the principles of electromagnetism.
05.02	Explain the magnetic properties of circuits and devices.
05.03	Relate electricity to the nature of matter.
05.04	Describe various ways that electricity is produced.
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 AC theory and solve related mathematical problems using appropriate test equipment.
07.04	Solve math-related problems from measurements on training aids. (Optional)
08.0	Demonstrate further understanding of electricity--The student will be able to:
08.01	Explain molecular action as a result of temperature extremes, chemical reaction and moisture content.
08.02	Explain how voltage is produced by chemical, mechanical, thermal, photoelectric and piezo electric means.
08.03	Identify electrical symbols in construction documents.
09.0	Demonstrate science knowledge and skills related to electrical principles--The student will be able to:
09.01	Discuss the role of creativity in constructing scientific questions, methods and explanations.
09.02	Formulate scientifically investigable questions, construct investigations, collect and evaluate data and develop scientific recommendations based on findings.

**Course Number: BCV0640**  
**Occupational Completion Point: B**  
**Residential Electrician – 450 Hours -- SOC Code 47-2111**

10.0	Demonstrate proficiency in electrical math problems and skills--The student will be able to:
10.01	Calculate wiring costs.
10.02	Draw an industrial electrical-wiring plan.
10.03	Describe the use of high-voltage test equipment.
10.04	Describe how to test insulation.
10.05	Describe how to balance a load.
10.06	Use electrical related math skills.
11.0	Demonstrate 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	Apply the principles of transformers to AC circuits.

11.04	Identify the properties of an AC signal.
11.05	Identify AC sources.
11.06	Analyze and apply the principles of transformers to AC circuits.
11.07	Analyze polyphase circuits.
11.08	Install a simple polyphase circuit.
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 research requirements for career advancement.
12.08	Research 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	Draw a residential wiring plan, using electrical-wiring symbols.
13.03	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 or national electric codes.
13.04	Identify, install and wire a duplex- receptacle-outlet circuit, a split-circuit duplex-receptacle-outlet circuit and a special-purpose receptacle-outlet circuit according to the specifications, complying with the appropriate local, state or 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 equipment.
14.04	Install the following, complying with the appropriate local, state, or national electric codes: <ul style="list-style-type: none"> <li>a. Service-entrance main panel</li> <li>b. Service-entrance meter base</li> <li>c. Alarm system/smoke detectors</li> </ul>
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 -- SOC Code 47-2111**

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, materials and wires to complete a job.
15.04	Install the following according to the plan and specifications, complying with appropriate electric codes: <ul style="list-style-type: none"> <li>a. Wire mold</li> <li>b. Conduit, duct and raceway systems</li> <li>c. Conductors in a conduit</li> </ul>
15.05	Describe the difference between a residential and a commercial lighting circuit.
15.06	Construct control circuits from schematics.
15.07	Describe high-voltage (over 600V) wiring requirements.
15.08	Demonstrate knowledge of installing wiring in hazardous areas.
15.09	Explain a commercial three-phase receptacle circuit and an emergency-lighting system.
15.10	Explain commercial-service-entrance requirements.
16.0	Demonstrate specialized electrical skills--The student will be able to:
16.01	Explain solid-state control devices.

16.02 Explain data cable installation according to the plan and specifications.

**Course Number: BCV0667**  
**Occupational Completion Point: D**  
**Industrial Electrician – 300 Hours – SOC Code 47-2111**

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:  
a. Conductor size  
b. Overcurrent protection  
c. Overload protection  
d. Short circuit protection

17.05 Install a 277 V 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:  
a. Disconnect switch - fused and unfused  
b. Raceways  
c. Emergency stop switch  
d. Circuit breaker  
e. Panelboard

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 3 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: a. Series b. Shunt c. Compound
18.02	Install and connect the following types of single phase AC motors: a. Capacitor-start b. Capacitor-start and run c. Split-phase inductor d. Universal e. Repulsion-start, induction-run
18.03	Install and connect the following types of three phase AC motors: a. Squirrel-cage induction b. Wound-rotor c. 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: a. Thermal b. Magnetic c. 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: a. Start/stop station b. Forward/reverse/stop station c. Hands/off/auto station d. Start/jog/stop station e. Limit switches f. Pressure, temperature, level and float switches g. Pilot, run and stop indicator lights h. Control relay and timing relays

i. 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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

### **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 (if applicable)**

In PSAV 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: Mathematics 9, Language 9, and Reading 9. 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(7), 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(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

## **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

**PSAV**

Program Number	I460401
CIP Number	0646041502
Grade Level	30, 31
Standard Length	1050 Hours
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9071 - Maintenance and Repair Workers
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 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	SOC Code
A	BCV0400	Building Construction Helper	AC HEAT MC @7 7G BLDG CONST @7 7G BLDG MAINT @7 7G CARPENTRY @7 7G	450 Hours	49-9071
B	BCV0401	Building Construction Technician 1	DRAFTING @7 7G ELECTRICAL @7 7G ENG 7G	300 Hours	49-9071
	BCV0402	Building Construction Technician 2	TEC CONSTR @7 7G TEC DRAFT 7G TROWEL TR 7G PLUMBIN @7 7G SHEETMETAL @7 7G WOODWORKIN @4	450 Hours	49-9071



## **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 Demonstrate carpentry skills.
- 07.0 Read and interpret construction drawings.
- 08.0 Frame floor systems based on drawing and specification requirements.
- 09.0 Frame walls and ceilings based on drawing and specification requirements.
- 10.0 Frame a roof based on drawing and specification requirements.
- 11.0 Analyze construction components, materials, hardware and characteristics.
- 12.0 Demonstrate masonry skills.
- 13.0 Erect, plumb and brace a simple concrete form with reinforcement.
- 14.0 Place concrete.
- 15.0 Lay masonry units.
- 16.0 Demonstrate science knowledge and skills.
- 17.0 Understand construction documents, contract documents and specifications.
- 18.0 Select the appropriate heavy equipment for a given task. (Optional)
- 19.0 Identify local, state and federal codes and regulations.
- 20.0 Perform site preparation and maintenance.
- 21.0 Estimate project costs and schedule construction activities for a specific job.
- 22.0 Explain all that the built environment encompasses.
- 23.0 Investigate sustainability issues related to the design, construction and maintenance of the built environment.
- 24.0 Complete a construction project using skills learned in the program.
- 25.0 Install roofing materials.
- 26.0 Install exterior finishes.
- 27.0 Explain the importance of employability and entrepreneurship skills.
- 28.0 Demonstrate interior carpentry skill.
- 29.0 Install cabinets.
- 30.0 Prepare and apply finishes to surfaces.
- 31.0 Build stairs.
- 32.0 Troubleshoot, repair and install plumbing systems.
- 33.0 Demonstrate knowledge of drain, waste and vent (DWV) systems.
- 34.0 Measure, cut and join plastic piping.
- 35.0 Properly measure, ream, cut and join copper piping.
- 36.0 Troubleshoot, repair and install electrical systems.
- 37.0 Demonstrate electrical safety.

- 38.0 Demonstrate a basic understanding of the heating, ventilation and air-conditioning (HVAC) profession.
- 39.0 Maintain, repair and install heating, ventilation and air-conditioning (HVAC) systems.

Florida Department of Education  
Student Performance Standards

Program Title: Building Construction Technologies  
PSAV Number: I460401

<b>Course Number: BCV0400</b>	
<b>Occupational Completion Point: A</b>	
<b>Building Construction Helper – 450 Hours – SOC Code 49-9071</b>	
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	Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200)
01.04	Identify and use safety equipment and personal protective equipment (PPE).
01.05	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
01.06	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	Describe the development of construction technology, its impact on the built environment and the impact of growth on the construction industry.
02.02	Describe the benefits of the construction industry on health and safety, communication, transportation and the economy.
02.03	Demonstrate an understanding of the relationship between construction and the environment.
02.04	Describe the role of trade unions in the construction industry.
02.05	Demonstrate an understanding of apprenticeship.
02.06	Identify the different classifications of construction projects.
02.07	Define the roles and responsibilities of the general contractor, specialty contractor, construction management and design build firms.
02.08	Identify construction trade occupations and the roles and responsibilities of each craft.

02.09	Identify construction management occupations and the roles and responsibilities of each.
02.10	Identify design and engineering occupations and the roles and responsibilities of each.
02.11	Demonstrate an understanding of the relationship between construction and the economy.
02.12	Describe the process of applying for building permits and variances.
02.13	Demonstrate an understanding 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	Identify and use various types of drill bits.
03.05	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, 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 miter saws, drill presses, grinders, electric routers and pneumatic nailers.
04.02	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, 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	Demonstrate carpentry skills--The student will be able to:
06.01	Construct various types of concrete forms.
06.02	Describe in-beds used in concrete formwork.
06.03	Identify appropriate form stripping and handling techniques.
06.04	Lay out and install framing members for a structure.
06.05	Demonstrate the ability to dry in a structure.
07.0	Read and interpret construction drawings--The student will be able to:
07.01	Identify basic construction drawing terms, components and symbols.
07.02	Locate sections, elevations and details to their location on the plan view.
07.03	Use drawing dimensions to lay out a construction project,
07.04	Interpret and use architectural scales.
08.0	Frame floor systems based on drawing and specification requirements--The student will be able to:
08.01	Identify floor and sill framing and support members.
08.02	Name the methods used to fasten sills to the foundation.
08.03	Understand how girder/beam and joist sizes are selected.
08.04	List and recognize different types of floor joists.
08.05	List and recognize different types of bridging.
08.06	List and recognize different types of flooring materials.
08.07	Explain the purposes of subflooring and underlayment.
08.08	Match selected fasteners used in floor framing to their correct uses.
08.09	Estimate the amount of material needed to frame a floor assembly.

08.10	Demonstrate the ability to:
a.	Lay out and construct a floor assembly
b.	Install bridging (wood cross bridging, solid wood bridging and steel cross bridging).
c.	Install joists for a cantilever floor.
d.	Install a subfloor using butt-joint plywood/OSB panels and structural particle board.
e.	Install a single floor system using tongue-and-groove plywood/OSB panels.
09.0	Frame walls and ceilings based on drawing and specification requirements--The student will be able to:
09.01	Identify the components of a wall and ceiling layout.
09.02	Describe the procedure for laying out a wood frame wall, including plates, corner posts, door and window openings, partitions, bracing and the use of fire stops where applicable.
09.03	Describe the correct procedure for assembling and erecting an exterior wall.
09.04	Identify the common materials and methods used for installing sheathing on walls.
09.05	Lay out, assemble, erect and brace exterior walls for a frame building.
09.06	Describe wall framing techniques used in masonry construction.
09.07	Explain the use of metal studs in wall framing.
09.08	Describe the correct procedure for laying out ceiling joists.
09.09	Cut and install ceiling joists on a wood frame building.
09.10	Estimate the materials required to frame walls and ceilings.
10.0	Frame a roof based on drawing and specification requirements--The student will be able to:
10.01	Understand the terms associated with roof framing.
10.02	Identify the roof framing members used in gable and hip roofs.
10.03	Identify the methods used to calculate the length of a rafter.
10.04	Identify the various types of trusses used in roof framing.
10.05	Use a rafter framing square, speed square and calculator in laying out a roof.

10.06	Identify various types of sheathing used in roof construction.
10.07	Frame a gable roof with vent openings.
10.08	Frame a roof opening.
10.09	Erect a gable roof using trusses.
10.10	Estimate the materials used in framing and sheathing a roof.
11.0	Analyze construction components, materials, hardware and characteristics--The student will be able to:
11.01	Identify the components of various kinds of structures including slabs and foundations, interior and exterior walls, roofs and flooring systems.
11.02	Identify the types of wall sections.
11.03	Identify the types and installation procedures of roof, wall and floor sheathing.
11.04	Identify various roof supports.
12.0	Demonstrate masonry skills--The student will be able to:
12.01	Select the tools and equipment used for mixing mortar.
12.02	Describe the factors that affect the consistency of mortar.
12.03	Identify the common ratios (M, N, S and O) of mortar mixtures.
12.04	Identify pointing tools and strike mortar joints.
12.05	Repoint old work.
12.06	Prepare a work area, protecting adjacent areas.
12.07	Apply mortar.
12.08	Identify the methods of putting up the line.
12.09	Identify the types of trowels.
12.10	Identify various types of caulking and application.
12.11	Describe procedures for stucco application and repair.
12.12	Mix various types of stucco.



12.13	Understand the various types of concrete, considering application and Pounds per Square Inch (PSI) strength.
12.14	Identify and select concrete tools.
12.15	Demonstrate procedures for concrete repair and installation.
12.16	Identify and select cleaning materials and equipment.
12.17	Demonstrate safe and proper procedures for cleaning equipment, materials, work areas and worker.
12.18	Identify, select, use and maintain tools, materials and equipment used in masonry.
12.19	Use safe and proper procedures for cleaning equipment, materials, work areas and worker.
13.0	Erect, plumb and brace a simple concrete form with reinforcement--The student will be able to:
13.01	Identify the properties of cement.
13.02	Describe the composition of concrete.
13.03	Perform volume estimates for concrete quantity requirements.
13.04	Identify types of concrete reinforcement materials and describe their uses.
13.05	Identify various types of footings and explain their uses.
13.06	Identify the parts of various types of forms.
13.07	Explain the safety procedures associated with the construction and use of concrete forms.
14.0	Place concrete--The student will be able to:
14.01	Slump test concrete before placement.
14.02	Identify equipment used to transport and place concrete.
14.03	Describe the factors that contribute to the quality of concrete placement.
14.04	Demonstrate the correct methods for placing and consolidating concrete into forms.
14.05	Demonstrate how to use a screed to strike off and level concrete to the proper grade in a form.
14.06	Demonstrate how to use tools for placing, floating and finishing concrete.
14.07	Determine when conditions permit the concrete finishing operation to start.

14.08	Name the factors that affect the curing of concrete and describe the methods used to achieve proper curing.
15.0	Lay masonry units--The student will be able to:
15.01	Describe the most common types of masonry units.
15.02	Describe how to set up and plumb a wall.
15.03	Lay a dry bond.
15.04	Spread and furrow a bed joint and butter masonry units.
15.05	Describe the different types of masonry bonds.
15.06	Cut brick and block accurately.
16.0	Demonstrate science knowledge and skills--The student will be able to:
16.01	Explain molecular action as a result of temperature extremes, chemical reaction and moisture content.
16.02	Discuss the role of creativity in constructing scientific questions, methods and explanations.
16.03	Formulate scientifically investigable questions, construct investigations, collect and evaluate data and develop scientific recommendations based on findings.
16.04	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.
16.05	Explain pressure measurement in terms of PSI and inches of mercury.
16.06	Explain and demonstrate the use of electrical-system testing devices.
17.0	Understand construction documents, contract documents and specifications--The student will be able to:
17.01	Explain the purpose and components of contract documents and specifications.
17.02	Read, interpret and apply plans, elevations, sections and details.
17.03	Explain the relationships of the elements of contract documents.
17.04	Create lists of materials and prepare estimates.
17.05	Use architectural and engineering scales.
17.06	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)
17.07	Compare and analyze traditional drafting with computer-aided drafting (CAD) and building information modeling (BIM) to learn how

	technology has altered opportunities for innovative responses and results.
17.08	Investigate the use of technology and other resources to inspire design decisions.
18.0	Select the appropriate heavy equipment for a given task (Optional)--The student will be able to:
18.01	Identify different types and uses of heavy equipment.
18.02	Describe the operations of different types of heavy equipment.
19.0	Identify local, state and federal codes and regulations--The student will be able to:
19.01	Identify and locate local, state and federal codes, regulations and standards.
19.02	Identify local, state and federal regulatory agencies.
20.0	Perform site preparation and maintenance--The student will be able to:
20.01	Understand zoning requirements.
20.02	Determine boundary lines.
20.03	Determine elevations.
20.04	Understand the need to add, remove or relocate fill to proper compaction.
20.05	Lay out and mark building location and elevation.
20.06	Clean and maintain the site.
21.0	Estimate project costs and schedule construction activities for a specific job--The student will be able to:
21.01	Calculate material quantities and purchase cost (including sales tax).
21.02	Calculate labor costs including work hours, duration and cost of workers.
21.03	Explain and compute federal, state and local taxes.
21.04	Schedule various construction activities.
22.0	Explain all that the built environment encompasses--The student will be able to:
22.01	Research the development of construction technology, its impact on the built environment and the impact of growth on the construction industry.
22.02	Describe and give examples of the influences and benefits of the construction industry on health and safety, communication, transportation and the economy.

22.03	Examine and compare the relationship between the built environment and the natural environment.
22.04	Compare architectural designs and/or models to understand how technical and utilitarian components impact aesthetic qualities.
22.05	Analyze changes in architectural styles and construction practices over time relative to various environments.
22.06	Describe the significance of major architects, engineers or inventors to understand their historical influences.
22.07	Research innovative historical architectural and/or engineering works and examine the significance of their legacy for the future.
22.08	Identify transitions in design media, technique and focus to explain how technology has changed design throughout history.
23.0	Investigate sustainability issues related to the design, construction and maintenance of the built environment--The student will be able to:
23.01	Describe the impact of the construction industry on the natural environment.
23.02	Describe the life cycle phases of a building and its impacts on the environment throughout the life of the building.
23.03	Recommend sustainable alternatives to conventional construction practices.
23.04	Identify specific practices that can lessen adverse impacts on the environment.
23.05	Understand holistic green construction.
24.0	Complete a construction project using skills learned in the program—The student will be able to:
24.01	Manipulate materials, techniques and processes through practice and perseverance using malleable and/ or rigid materials to create a 3-dimensional representational or abstract model.
24.02	Use divergent thinking, abstract reasoning and various processes to demonstrate imaginative or innovative solutions for a project.
24.03	Develop competence and dexterity through practice in the use of processes, tools and techniques.
24.04	Solve design and construction problems, through convergent and divergent thinking, to gain new perspectives.
24.05	Apply critical-thinking and problem solving skills used in design to develop solutions for real-life issues.
24.06	Use critical thinking skills for various contexts to develop, refine and reflect on a design theme.
24.07	Use and maintain tools and equipment to facilitate design and construction process.
24.08	Work in a project team to show creative cohesiveness, team building, respectful compromise and time-management skills.

**Course Number: BCV0401**  
**Occupational Completion Point: --**  
**Building Construction Technician – 300 Hours – SOC Code 49-9071**

25.0 Install roofing materials--The student will be able to:

25.01 Identify and explain different types of roofing systems and applications.

25.02 Install various types of shingles.

25.03 Install roof gutters and downspouts.

25.04 Seal pipes and vents on roofs.

25.05 Identify installation procedures for sheet metal roofs, built-up roofs and roof flashing.

26.0 Install exterior finishes--The student will be able to:

26.01 Describe the purpose of wall insulation and flashing.

26.02 Install common cornices.

26.03 Demonstrate lap and panel siding estimating methods.

26.04 Describe the types and applications of various types of siding (e.g. wood, fiber-cement, vinyl, metal, stucco, masonry, etc.).

26.05 Install siding.

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.

28.0	Demonstrate interior carpentry skill--The student will be able to:
28.01	Install interior finish materials.
28.02	Install exterior and interior doors.
29.0	Install cabinets--The student will be able to:
29.01	Identify the parts of a cabinet.
29.02	Identify the types of cabinet-door installation.
29.03	Identify the types of cabinet hardware.
29.04	Install cabinet hardware.
29.05	Describe cabinet-installation procedures.
30.0	Prepare and apply finishes to surfaces--The student will be able to:
30.01	Erect an extension ladder and a scaffold.
30.02	Prepare the surfaces.
30.03	Apply finished coatings to surfaces with a roller, brush and sprayer.
31.0	Build stairs--The student will be able to:
31.01	Identify various types and parts of stairs.
31.02	Identify materials used in the construction of stairs.
31.03	Interpret construction drawings of stairs.
31.04	Calculate the total rise, the number and size of the risers and treads required for a stairway.
31.05	Lay out and cut stringers, risers and treads.
<b>Course Number: BCV0402</b>	
<b>Occupational Completion Point: B</b>	
<b>Building Construction Technician – 300 Hours – SOC Code 49-9071</b>	
32.0	Troubleshoot, repair and install plumbing systems--The student will be able to:
32.01	Troubleshoot, repair and install bathroom fixtures and hardware such as lavatories, water closets, urinals, showers, bathtubs, traps and drain, waste and vent (DWV) systems.
32.02	Troubleshoot, repair and install kitchen fixtures and hardware, such as sinks, garbage disposals, faucets and hot-water-heater

	tanks.
32.03	Identify and install various pipes and tubing used in the plumbing trade.
32.04	Test and inspect plumbing systems.
33.0	Demonstrate knowledge of drain, waste and vent (DWV) systems-- The student will be able to:
33.01	Explain how waste moves from a fixture through the drain system to the environment.
33.02	Identify the major components of a drainage system and describe their functions.
33.03	Identify the different types of traps and their components, explain the importance of traps and identify the ways that traps can lose their seals.
33.04	Identify the various types of drain, waste and vent (DWV) fittings and describe their applications.
33.05	Identify significant code and health issues, violations and consequences related to DWV systems.
34.0	Measure, cut and join plastic piping--The student will be able to:
34.01	Identify types of materials and schedules of plastic piping.
34.02	Identify proper and improper applications of plastic piping.
34.03	Identify types of fittings and valves used with plastic piping.
34.04	Identify and determine the kinds of hangers and supports needed for plastic piping.
34.05	Identify the various techniques used in hanging and supporting plastic piping.
34.06	Explain proper procedures for the handling, storage and protection of plastic pipes.
35.0	Properly measure, ream, cut and join copper piping--The student will be able to:
35.01	Identify the types of materials and schedules used with copper piping.
35.02	Identify the material properties, storage and handling requirements of copper piping.
35.03	Identify the types of fittings and valves used with copper piping.
35.04	Identify the techniques used in hanging and supporting copper piping.
35.05	Identify the hazards and safety precautions associated with copper piping.
36.0	Troubleshoot, repair and install electrical systems--The student will be able to:

36.01	Explain basic electrical theory.
36.02	Explain branch circuit systems.
36.03	Calculate and select service-entrance equipment.
36.04	Identify and explain Ground Fault Circuit Interrupter (GFCI) circuitry.
36.05	Troubleshoot electrical systems, using testing and metering devices.
36.06	Install electrical outlets, switches and light fixtures.
36.07	Install and replace breakers and fuses.
36.08	Identify types of wiring raceways.
36.09	Wire a blower motor into an electrical supply.
36.10	Test and inspect electrical systems.
36.11	Explain basic motor-control operation.
36.12	Describe rules for installing electric space heating and HVAC requirements.
37.0	Demonstrate electrical safety--The student will be able to:
37.01	Identify electrical hazards and how to avoid or minimize them in the workplace.
37.02	Explain safety issues concerning lockout/tag-out procedures, confined space entry, respiratory protection and fall protection systems.
37.03	Develop a task plan and hazard assessment for a given task and select the appropriate personal protective equipment (PPE) and work methods.
37.04	Explain the Role of the National Electric Code and describe how to determine electric service requirements.
38.0	Demonstrate a basic understanding of the heating, ventilation and air-conditioning (HVAC) profession--The student will be able to:
38.01	Identify careers in the HVAC industry and the educational pathways (including apprenticeships) available.
38.02	Explain what the 'Clean Air Act' means to the HVAC profession.
38.03	Describe regulatory codes relevant to the HVAC industry.
38.04	Read and interpret HVAC plans and schedules.
39.0	Maintain, repair and install heating, ventilation and air-conditioning (HVAC) systems--The student will be able to:



39.01	Explain heating and cooling principles and code requirements.
39.02	Describe methods of calculating heating and cooling loads.
39.03	Explain the operation and types of the following heating methods: water, steam, forced air, gas, electrical components and heat pumps.
39.04	Troubleshoot and repair a circulation pump, zone valves, burners, pilot lights and thermocouples in a heating system.
39.05	Identify refrigerants.
39.06	Determine a refrigerant level.
39.07	Describe the proper procedures for descaling air-conditioner units.
39.08	Troubleshoot, repair and replace air filters, drive belts and drain systems.
39.09	Troubleshoot, repair and replace control systems.
39.10	Explain the computer monitoring system associated with heating, ventilation and air-conditioning (HVAC) control systems and air-quality 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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

### **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 (if applicable)**

In PSAV 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: Mathematics 9, Language 9, and Reading 9. 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(7), 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(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

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

**PSAV**

Program Number	I460408
CIP Number	0646040800
Grade Level	30, 31
Standard Length	600 Hours
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-2141 - Painters, Construction and Maintenance
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

**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 consisting of one occupational completion point.

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	SOC Code
A	BCV0164 BCV0165	Painter and Paper Hanger 1 Painter and Paper Hanger 2	TEC CONSTR ¶ 7 ¶ G BLDG CONST ¶ 7 ¶ G	300 Hours	47-2141
	BCV0164 BCV0165	Painter and Paper Hanger 1 Painter and Paper Hanger 2	PAINTING 7G	300 Hours	47-2141

## **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 ability to work safely.
- 02.0 Select, use and care for tools and equipment, scaffolding and ladders.
- 03.0 Demonstrate proficiency in preparation of surfaces.
- 04.0 Demonstrate the use of the materials used in painting.
- 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

Program Title:     **Painting and Decorating**  
PSAV Number:     **I460408**

<b>Course Number: BCV0164</b>	
<b>Occupational Completion Point:</b>	
<b>Painter and Paper Hanger 1 – 300 Hours – SOC Code 47-2141</b>	
01.0	Demonstrate the ability to 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.
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	Demonstrate proficiency in preparation of surfaces--The student will be able to:
03.01	Prepare new wood surfaces for coating with paint.
03.02	Remove old wall coverings.
03.03	Prepare and seal walls for wall coverings.
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.
03.07	Spackle/patch sheetrock and plaster surfaces.
04.0	Demonstrate the use of the materials used in painting--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.
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 from a painted surface using a chemical solution.
06.02	Use prepared solutions to clean a surface.
06.03	Apply rust inhibitors to metal surfaces.
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.
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.

**Course Number: BCV0165**  
**Occupational Completion Point: A**  
**Painter and Paper Hanger – 300 Hours – SOC Code 47-2141**

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.

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 Formulate scientifically investigable questions, construct investigations, collect and evaluate data and develop scientific recommendations based on findings.

11.04 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.

11.05 Understand pressure measurement in terms of PSI, inches of mercury and KPA.

12.0 Apply stains, varnishes, lacquers and acrylics--The student will be able to:

12.01 Stain woodwork to a uniform color.

12.02 Stain wood to match a sample.

12.03 Seal wood for finishing.

12.04 Apply a varnish finish to a prepared wood surface.

12.05	Apply an oil finish to a prepared wood surface.
12.06	Apply a lacquer finish to a prepared wood surface.
12.07	Apply an acrylic finish to a prepared wood 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.
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.

## **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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

SkillsUSA is the intercultural 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 (if applicable)**

In PSAV 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: Mathematics 9, Language 9, and Reading 9. 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(7), 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(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

## **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 Technology  
**Program Type:** Career Preparatory  
**Career Cluster:** Architecture & Construction

**PSAV**

Program Number	I460513
CIP Number	0646050302
Grade Level	30, 31
Standard Length	960 Hours
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-3015 - Helpers—Pipelayers, Plumbers, Pipefitters, and Steamfitters 47-2152 - Plumbers, Pipefitters, and Steamfitters
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 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	SOC Code
A	BCV0508	Helper, Plumber, Pipefitter	PLUMBIN @7 7G BLDG CONST ¶ 7 ¶ G TEC CONSTR ¶ 7 ¶ G	360 Hours	47-3015
B	BCV0540	Residential Plumber		240 Hours	47-2152
C	BCV0562	Commercial Plumber		240 Hours	47-2152
D	BCV0592	Plumber		120 Hours	47-2152

## **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 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 mathematics knowledge and skills.
- 06.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
- 07.0 Read and interpret construction documents.
- 08.0 Read and interpret basic pipe-trade codes.
- 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 Lay out and coordinate a job.
- 14.0 Install first rough (underground).
- 15.0 Install second rough (first floor and above).
- 16.0 Trim out plumbing.
- 17.0 Explain the importance of employability and entrepreneurship skills.
- 18.0 Install hot-water-heating and circulating-systems.
- 19.0 Install interceptors and separators.
- 20.0 Install a storm drainage system.
- 21.0 Explain the principles of backflow cross and connection control.
- 22.0 Explain the process of installing a medical gas system. (optional)
- 23.0 Explain how a Liquid Propane Gas (LPG) system works.
- 24.0 Repair, service and maintain plumbing systems.
- 25.0 Explain how to connect residential plumbing to a municipal sewer line. (optional)

Florida Department of Education  
Student Performance Standards

Program Title: Plumbing Technology  
PSAV Number: I460513

<b>Course Number: BCV0508</b>	
<b>Occupational Completion Point: A</b>	
<b>Plumber Helper – 360 Hours – SOC Code 47-3015</b>	
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	Create a disaster and/or emergency response plan.
04.07	Demonstrate Cardiopulmonary Resuscitation (CPR) techniques.
04.08	Demonstrate an understanding of when and how to use first aid.
04.09	Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200)
05.0	Demonstrate 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.
05.02	Measure tolerances on horizontal and vertical surfaces, using millimeters, centimeters, feet and inches.
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 offset and metric conversion.
05.05	Calculate material length and bend pipe by hand or with a pipe-bending machine and tools.
05.06	Construct charts/tables/graphs using functions and data.
06.0	Demonstrate science knowledge and skills --The student will be able to:
06.01	Discuss the role of creativity in constructing scientific questions, methods and explanations.
06.02	Describe molecular action as a result of temperature and pressure extremes, chemical reaction and moisture content.
06.03	Formulate scientifically investigable questions, construct investigations, collect and evaluate data and develop scientific recommendations based on findings.
06.04	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.
06.05	Discuss environmental concerns related to hazardous waste and chemical disposal.
06.06	Explain pressure measurement in terms of Pounds per Square Inch (PSI), inches of mercury and KPA.
06.07	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.
07.03	Identify the basic symbols used in the pipe trades.
07.04	Read and interpret manufacturers' schematics and specifications.
08.0	Read and interpret basic 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.
08.03	Read and interpret basic building codes in the pipe-trade industry.

**Course Number: BCV0540**  
**Occupational Completion Point: B**  
**Residential Plumber -- 240 Hours – SOC Code 47-2152**

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:
	a. Pipe and fitting
	b. Pipe-joining methods
	c. Plumbing fixtures, appliances, materials and equipment
	d. 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, clamping, compression, threading, flange, flaring, gasket joint, gluing, soldering and welding.
10.02	Measure, mark and cut different types of pipes using various pipe cutters including one- and four-wheel steel pipe cutters, hack saw, tubing cutter and cutting torch.
10.03	Thread a steel pipe 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 applicable plumbing codes.
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	Lay out 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.
14.0	Install the first rough (underground)--The student will be able to:
14.01	Lay out a job on site underground and establish a starting point according to codes and specifications, coordinating with other crafts.
14.02	Install building drain, waste, vent, storm drainage and water-heating-and-circulating systems.
14.03	Install distribution systems.
14.04	Install a temporary water service with backflow prevention.
14.05	Test and inspect the first rough.

15.0	Install the second rough (first floor and above)--The student will be able to:
15.01	Lay out a job on site for the first floor and above according to codes and specifications, coordinating with other crafts.
15.02	Cut openings in walls and floors to accommodate the pipe and fittings.
15.03	Install hangers and supports.
15.04	Install building-drain, waste vent, storm-drainage; and water-heating-and-circulating systems, including hot-tubs and spas.
15.05	Install distribution systems.
15.06	Test and inspect the second rough.
16.0	Trim out plumbing--The student will be able to:
16.01	Distribute and place fixtures, appliances and equipment, including safety devices and control.
16.02	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	Install backflow assemblies as required.
16.04	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	Identify opportunities and research requirements for career advancement.
17.08	Research the benefits of ongoing professional development.
17.09	Examine and describe entrepreneurship opportunities as a career planning option.

**Course Number: BCV0562**  
**Occupational Completion Point: C**  
**Commercial Plumber -- 240 Hours – SOC Code 47-2152**

18.0 Install hot-water-heating and circulating systems--The student will be able to:

18.01 Explain the basic theory of domestic hot-water-heating.

18.02 Design, size and lay out a system.

18.03 Identify the equipment and materials needed for the job in accordance with job specifications and plumbing codes.

18.04 Test and inspect the system.

19.0 Install 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 Install and maintain lint and grease traps, gas and oil separators, sand and sediment interceptors.

20.0 Install 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 lay out a storm-drainage system.

20.03 Identify the materials needed to install a storm-drainage system in accordance with job specifications and plumbing codes.

20.04 Lay out a job on site according to job specifications and plumbing codes, coordinating with other trades.

20.05 Illustrate roof drains, leaders and drainage systems.

20.06 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: BCV0592**  
**Occupational Completion Point: D**  
**Plumber -- 120 Hours – SOC Code 47-2152**

22.0 Explain the process of installing a medical gas system (optional)--The student will be able to:

22.01 Explain the procedures for:

- a. Installing a medical gas system in a health-care facility according to applicable plumbing codes
- b. Connecting medical equipment, safety devices and controls
- c. Testing and inspecting medical gas systems to make sure there is no cross connection and the system is pure

23.0 Explain how a Liquid Propane Gas (LPG) system works--The student will be able to:

23.01 Identify materials required for LPG installation.

23.02 Explain how to size and lay out a job on site according to plumbing codes and specifications codes.

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 line (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 house drain to a sewer main.

25.03 Connect the house drain to the sewer main.

25.04 Test and inspect the system.

## **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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

### **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 (if applicable)**

In PSAV 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: Mathematics 9, Language 9, and Reading 9. 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(7), 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(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

## **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

**NOTE:** This program has been daggered for deletion due to low/ no enrollment.

PSAV	
Program Number	I460514
CIP Number	0646050303
Grade Level	30, 31
Standard Length	600 Hours
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-2152 - Plumbers, Pipefitters, and Steamfitters
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 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	SOC Code
A	BCV0568	Industrial Pipefitter Helper	PLUMBIN @7 7G	300 Hours	47-2152
B	BCV0569	Industrial Pipefitter	BLDG CONST ¶ 7 ¶G TEC CONSTR ¶ 7 ¶G	300 Hours	47-2152

## **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, 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  
PSAV Number: I460514

<b>Course Number: BCV0568</b>	
<b>Occupational Completion Point: A</b>	
<b>Industrial Pipefitter Helper – 300 Hours – SOC Code 47-2152</b>	
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 cast iron pipe.
11.03	Install ductile iron pipe.
11.04	Install vitrified clay pipe.
11.05	Install concrete pipe.
11.06	Install carbon steel pipe.
11.07	Install fiberglass pipe.
11.08	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 – SOC Code 47-2152**

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 equivalentents.
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.
28.08	Identify cast iron soil pipe fittings.
28.09	Assemble cast iron soil pipe with lead-and-oakum joints.

28.10	Assemble cast iron soil pipe with compression joints.
28.11	Assemble cast iron soil pipe with no-hub joints.
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, 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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

### **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 (if applicable)**

In PSAV 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: Mathematics 9, Language 9, and Reading 9. 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(7), 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(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

## **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:** Architectural and Construction

**PSAV**

Program Number	I463112
CIP Number	0646010103
Grade Level	30,31
Standard Length	1650 Hours
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-3011- Helpers—Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters 47-2021- Brickmasons and Blockmasons
Basic Skills Level	Mathematics: 9 Language: 8 Reading: 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	SOC Code
A	BCV0330	Masonry Tender	BLDG CONST ¶ 7 ¶G TEC CONSTR ¶ 7 ¶ G TROWEL TR 7G	450 Hours	47-3011
B	BCV0360	Bricklayer Helper		300 Hours	47-3011
C	BCV0362	Brickmason 1		450 Hours	47-2021
	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.
- 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 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  
PSAV Number: I463112

<b>Course Number: BCV0330</b>	
<b>Occupational Completion Point: A</b>	
<b>Masonry Tender – 450 Hours – SOC Code 47-3011</b>	
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 (MSDSs).
02.08	Demonstrate the use of and care of appropriate personal protective equipment (PPE).
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" corner return leads and a wall 4 feet high and 12 feet 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	Identify power tools.
05.04	Read ruler to the 1/16".
05.05	Read brick-spacing rules and brick modular rules.
05.06	Course brick to a given height with the brick spacing rule and 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. Customary (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	Butter head joints.
08.03	Set up masonry materials.
08.04	Pull a line.
08.05	Cut bricks and/or blocks with a hammer, a brick set and a trowel.
08.06	Temper mortar.
08.07	Maintain proper spacing of head and bed joints.
08.08	Point and tool joints in brick and/or block walls.
08.09	Lay brick and/or block to the line.
08.10	Repeat the above nine tasks with 8" block.
08.11	Demonstrate proper handling of materials to prevent damage.
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	Build a brick 4" corner return lead.
10.12	Identify common problems found in mortar application and their uses.
11.0	Demonstrate science knowledge and skills--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	Lay out and build chimneys and fireplaces.
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.
18.06	Place grout in a hollow block wall and rod it into place.
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	Install hollow metal frames.



19.05	Describe the functions of sills and lintels.
19.06	Install sills and lintels.
19.07	Install metal hardware.

**Course Number: BCV0360**  
**Occupational Completion Point: B**  
**Bricklayer Helper, Firebrick and Refractory – 300 Hours – SOC Code 47-3011**

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 leaser leveling instruments, transit and leveling rod.
21.05	Build batter boards and establish building lines and elevations.
21.06	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	Build various types of walls using proper reinforcement, jointing and bonding techniques.
22.04	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.
23.0	Apply construction techniques and moisture control—The student will be able to:
23.01	Construct masonry around windows, doors and other openings.
23.02	Construct pilasters and other types of bracing.
23.03	Install insulation used in conjunction with masonry construction.
23.04	Identify the need for moisture control in various types of masonry construction, and demonstrate the techniques used to eliminate moisture problems.
23.05	Construct corbelling in a double-wythe wall.
23.06	Join intersecting walls.
23.07	Install 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.

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 foundation walls to floor elevations.
25.07	Make foundation walls waterproof, if required.
25.08	Install 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.

**Course Number: BCV0362**  
**Occupational Completion Point:**  
**Brickmason – 450 Hours – SOC Code 47-2021**

28.0	Perform construction details--The student will be able to:
28.01	Build 4" and 8" brick corners.
28.02	Build 4", 6", 8" and 12" block corners.
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.

28.07	Construct a brick-veneer wall.
28.08	Set precast and built-in lintels.
28.09	Build modular brick walls.
28.10	Lay glass blocks.
28.11	Set door jams.
28.12	Reinforce masonry walls.
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 – 450 Hours – SOC Code 47-2021**

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, at an average daily rate of:
a.	100-200
b.	200-300
c.	300-400
d.	400-500
e.	500-600
f.	600-700
g.	700-800

	h. over 800
30.02	Lay and joint 8" block on a straight block wall, with established leads, at an average daily rate of:
	a. 50-100
	b. 100-150
	c. 150-200
	d. 200-250
	e. 250-300
	f. 300-350
	g. 350-400
	h. over 400
31.0	Demonstrate 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	State the safety procedures in high-rise construction.
31.04	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.
32.04	Demonstrate techniques for construction of stone walls and other stone building surfaces.
32.05	Demonstrate basic knowledge of various building materials such as glass block and refractory brick.

32.06 Describe the procedures for rebuilding fireplaces.

32.07 Replace a damaged brick in a wall.

32.08 Repair mortar joints.

## **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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

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

### **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 (if applicable)**

In PSAV 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: Mathematics 9, Language 8, and Reading 8. 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(7), 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(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

## **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

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

**PSAV – Cooperative Education - OJT**

Course Number	I469999
CIP Number	06469999CP
Grade Level	30, 31
Standard Length	Multiple hours
Teacher Certification	Refer to the <b>Course Structure</b> section.
CTSO	SkillsUSA

**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 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**

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

The following table illustrates the postsecondary course structure:

Course Number	Course Title	Teacher Certification	Length
I469999	Architecture and Construction Cooperative Education OJT	Any Certification appropriate to the students' chosen career field	Multiple 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 Perform designated job skills.
- 02.0 Demonstrate work ethics.

Florida Department of Education  
Student Performance Standards

Program Title:       Architecture and Construction Cooperative Education OJT  
PSAV Number:       I469999

<b>Standards and Benchmarks</b>	
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**

There is a **Cooperative Education Manual** available online that has guidelines for students, teachers, employers, parents and other administrators and sample training agreements.

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

SkillsUSA is the intercurricular 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 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:** Air-Conditioning, Refrigeration and Heating Technology  
**Program Type:** Career Preparatory  
**Career Cluster:** Architecture and Construction

**PSAV**

Program Number	I470203
CIP Number	0647020106
Grade Level	30, 31
Standard Length	1350 Hours
Teacher Certification	Refer to the <b><u>Program Structure</u></b> section.
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9021 - Heating, Air Conditioning, and Refrigeration Mechanics and Installers
Basic Skills Level	Mathematics: 10 Language: 9 Reading: 9

**Purpose**

The purpose of this program is to prepare students for employment or advanced training in the heating, air-conditioning, and refrigeration and ventilation 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 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 four occupational completion points. There are two course options, ACR0044 OR ACR0045, for occupational completion point D.

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	SOC Code
A	ACR0041	Air-Conditioning, Refrigeration and Heating Helper	AC HEAT ME @7 7G REFRG MECH 7 G	250 Hours	49-9021
B	ACR0043	Air-Conditioning, Refrigeration and Heating Mechanic Assistant		250 Hours	49-9021
C	ACR0047	Air-Conditioning, Refrigeration and Heating Mechanic 1		250 Hours	49-9021
	ACR0049	Air-Conditioning, Refrigeration and Heating Mechanic 2		250 Hours	49-9021
D	ACR0044	Air-Conditioning, Refrigeration and Heating Technician		350 Hours	49-9021
	<b>OR</b> ACR0045	<b>OR</b> Refrigeration Mechanic		350 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 Identify, use and maintain the tools and tool accessories used in the heating, air-conditioning and refrigeration industry.
- 03.0 Demonstrate mathematics knowledge and skills.
- 04.0 Demonstrate a practical knowledge of basic electricity and of the electrical components of heating, air-conditioning and refrigeration equipment.
- 05.0 Troubleshoot heating, air-conditioning and refrigeration electrical control systems and their components.
- 06.0 Select and test electrical generation and distribution components for commercial heating and air conditioning systems.
- 07.0 Maintain, test and troubleshoot electrical motors and their components for commercial heating and air-conditioning systems.
- 08.0 Troubleshoot and wire electrical motors and their components.
- 09.0 Operate solid-state electronics as used in heating, air-conditioning and refrigeration systems.
- 10.0 Evaluate single-phase and three-phase power as used in heating, air-conditioning and refrigeration systems.
- 11.0 Explain the function of basic electronics.
- 12.0 Describe the history and concepts of heating, air-conditioning and refrigeration.
- 13.0 Explain the properties of matter and heat behavior.
- 14.0 Analyze fluids, pressures, refrigerants and related codes.
- 15.0 Evaluate heating, air-conditioning and refrigeration system components and accessories.
- 16.0 Select appropriate commercial compressors.
- 17.0 Test and adjust commercial evaporative condensers.
- 18.0 Maintain, test and troubleshoot commercial evaporators.
- 19.0 Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
- 20.0 Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing.
- 21.0 Utilize and operate mechanical refrigeration servicing and testing equipment.
- 22.0 Assist in the installation of a residential heating and air-conditioning system and determine start-up procedures.
- 23.0 Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems.
- 24.0 Demonstrate a working knowledge of refrigerants and oils.
- 25.0 Conduct system startup and shutdown.
- 26.0 Explain the importance of employability and entrepreneurship skills
- 27.0 Use combustion-type heating servicing and testing equipment.
- 28.0 Troubleshoot combustion gas valves and regulators as used in heating, air-conditioning, refrigeration and ventilation systems.
- 29.0 Maintain, troubleshoot and repair commercial heating systems.
- 30.0 Explain how to install, maintain and repair heating, air-conditioning and refrigeration systems.
- 31.0 Demonstrate knowledge of retail refrigeration systems.
- 32.0 Demonstrate knowledge of commercial and industrial refrigeration systems.
- 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 Read construction documents.
- 41.0 Interpret, use and modify construction drawings and specifications.
- 42.0 Design heating and cooling systems.
- 43.0 Troubleshoot and repair commercial heating and air-conditioning systems.
- 44.0 Calculate commercial heating and air-conditioning loads.
- 45.0 Install air distribution systems.
- 46.0 Evaluate commercial airside systems.
- 47.0 Balance an air distribution system.
- 48.0 Select energy conservation equipment.
- 49.0 Analyze building management systems.
- 50.0 Recommend alternative heating and cooling systems for various case studies.
- 51.0 Demonstrate a working knowledge of electrical generation and distribution components for commercial heating and air conditioning systems.
- 52.0 Demonstrate a working knowledge of refrigeration-system vibration and insulation.
- 53.0 Apply commercial refrigeration-pipe sizing and troubleshooting procedures.
- 54.0 Use refrigeration-systems skills in commercial applications.
- 55.0 Demonstrate a working knowledge of refrigerated storage systems.
- 56.0 Diagnose, maintain and repair ice-making systems.
- 57.0 Use refrigeration electrical-system skills in commercial applications.
- 58.0 Maintain and troubleshoot commercial refrigeration systems.

Florida Department of Education  
Student Performance Standards

Program Title: Air Conditioning, Refrigeration and Heating Technology  
PSAV Number: I470203

<b>Course Number: ACR0041</b>	
<b>Occupational Completion Point: A</b>	
<b>Air-Conditioning, Refrigeration and Heating Helper – 250 Hours – SOC Code 49-9021</b>	
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 and use 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	Understand and apply Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), 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	Follow safety precautions when using hand and power tools.
01.12	Explain emergency procedures to follow in response to workplace accidents.

01.13	Create a disaster and/or emergency response plan.
02.0	Identify, use and maintain the tools and tool accessories used in the heating, air-conditioning and refrigeration industry--The student will be able to:
02.01	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.
02.02	Apply appropriate care and maintenance procedures for tools and tool accessories, following the directions in the tool-equipment manufacturer's manual.
03.0	Demonstrate mathematics knowledge and skills--The student 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.
04.0	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:
04.01	Explain the principles of electricity.
04.02	Explain single- and three-phase power distribution.
04.03	Define and explain watts, ohms, volts and amps.
04.04	Identify and explain electrical measuring tools and devices.
04.05	Explain the standards for and ways to measure watts, resistance, voltage and amperage, using appropriate instruments or devices.
04.06	Identify and explain appropriate electrical wiring symbols.
04.07	Draw and explain a wiring schematic diagram for a control system.
04.08	Create a wiring schematic for an air conditioner an electric furnace, a heat pump, an oil furnace (optional) and a gas furnace.
04.09	Explain codes and standards and safety requirements for working with the electrical components used in heating, air conditioning and refrigeration.
04.10	Troubleshoot protection devices, such as fuses and breakers.

05.0	Troubleshoot heating, air-conditioning and refrigeration electrical control systems and their components--The student will be able to:
05.01	Identify and explain the operations of electrical control systems and their components (zone damper motors, dual fuel lock out controls, outdoor thermostats/low ambient controls, defrost controls/timers and auxiliary heating controls, contactors, relays, circuit boards, motors, solenoids, and thermostats.).
05.02	Identify, install and troubleshoot controls for heating, air-conditioning and refrigeration systems.
05.03	Explain the operation of different types of electromechanical communicating, humidity control, and Wi-Fi operating thermostats.
05.04	Wire basic heating, air-conditioning and refrigeration systems.
05.05	Troubleshoot operational problems for different types of electromechanical communicating, humidity control, and Wi-Fi operating thermostats.
05.06	Explain the electrical and mechanical operations of the basic heat pump.
06.0	Select and test electrical generation and distribution components for commercial heating and air conditioning systems--The student will be able to:
06.01	Determine wire sizes and voltage drops.
06.02	Describe the operation of various types of transformers.
06.03	Draw and identify various power-transformers.
06.04	Test, size and replace protection devices such as fuses and breakers, motor starters and overloads.
07.0	Maintain, test and troubleshoot electrical motors and their components for commercial heating and air-conditioning systems--The student will be able to:
07.01	Explain how alternating current is developed and draw a sine wave.
07.02	Identify single-phase and three-phase wiring arrangements.
07.03	Explain how phase shift occurs in inductors and capacitors.
07.04	Describe the types of capacitors and their applications.

07.05	Explain the operation of single-phase and three-phase induction motors.
07.06	Identify the various types of single-phase motors and their applications.
07.07	Identify and explain the operations and applications of various types of electrical motors and their components as used in commercial heating and air-conditioning systems.
07.08	Maintain, test and troubleshoot various types of commercial electrical motors and their components as used in commercial heating and air-conditioning systems.
07.09	Demonstrate the proper use of motor testing equipment.
08.0	Troubleshoot and wire electrical motors and their components--The student will be able to:
08.01	Identify and explain the functions of various types of motors and their components.
08.02	Troubleshoot, test and analyze motors, using various methods.
08.03	Identify, troubleshoot and wire various types of electric motors.
08.04	Reverse the rotation of a motor.
09.0	Operate solid-state electronics as used in heating, air-conditioning and refrigeration systems--The student will be able to:
09.01	Explain the basic principles and functions of Direct Digital Control (DDC).
09.02	Explain basic solid-state circuits and boards.
09.03	Identify, test and replace circuits and boards.
09.04	Program a programmable thermostat.
10.0	Evaluate single-phase and three-phase power as used in heating, air-conditioning and refrigeration systems --The student will be able to:
10.01	Explain how the principles of designing an electrical system for residential heating and air-conditioning systems apply to commercial heating and air-conditioning systems.
10.02	Define and compare single- and multiphase voltage and current related to commercial heating and air-conditioning systems.

10.03	Calculate various circuit loads in commercial heating and air-conditioning applications using Ohm's law.
10.04	Troubleshoot electrical circuits for commercial heating and air-conditioning systems
11.0	Explain the function of basic electronics--The student will be able to:
11.01	Explain the basic theory of electronics and semiconductors.
11.02	Explain how various semiconductor devices such as diodes, LEDs and photo diodes work, and how they are used in power and control circuits.
11.03	Identify different types of resistors and explain how their resistance values can be determined.
11.04	Describe the operation and function of thermistors.

**Course Number: ACR0043**  
**Occupational Completion Point: B**  
**Air-Conditioning, Refrigeration and Heating Mechanic Assistant – 250 Hours – SOC Code 49-9021**

12.0	Describe the history and concepts of heating, air-conditioning and refrigeration--The student will be able to:
12.01	Explain the basic principles of heating, ventilation and air-conditioning.
12.02	Identify and explain the four major refrigeration components.
12.03	Identify and explain the characteristics of a compression-cycle refrigerant system.
12.04	Differentiate between air-conditioning and refrigeration.
12.05	Differentiate between split systems and package systems.
12.06	Describe the benefits of conditioned air and environments.
12.07	Identify various professional organizations, associations and societies and explain their purposes.
13.0	Explain the properties of matter and heat behavior--The student will be able to:



13.01	Describe and explain freezing point, critical temperature and absolute zero.
13.02	Explain the gas laws (Dalton, Boyle and Charles) used when dealing with air and its properties.
13.03	Describe matter, heat and heat transfer.
13.04	Differentiate between heat and temperature.
13.05	Explain and distinguish among the characteristics of the three states of matter.
13.06	Explain the relationship between temperature and humidity.
13.07	Differentiate between latent heat and sensible heat.
14.0	Analyze fluids, pressures, refrigerants and related codes--The student will be able to:
14.01	Identify the refrigeration cycle.
14.02	Identify and explain general safety issues and EPA rules and regulations regarding the handling of refrigerants.
14.03	Define and explain pressure, fluid and temperature.
14.04	Explain the standards for and ways to measure and calculate absolute and gauge pressures.
14.05	Identify and explain the classifications, properties and uses of different refrigerants.
14.06	Explain how fluids react and flow in a closed versus an open environment or vessel.
14.07	Define and identify "color-coding" of refrigerant cylinders.
14.08	Compare Pressure and Temperature (P/T) charts.
14.09	Explain the proper methods of transferring, storing and recovering refrigerants.
14.10	Explain the effects of an improper refrigerant and contaminants in a system.

15.0	Evaluate heating, air-conditioning and refrigeration system components and accessories--The student will be able to:
15.01	Explain the types, operation, use and maintenance requirements of
	a. Compressors (such as reciprocating, rotary, screw and scroll)
	b. Condensers and evaporators (such as evaporative condensers, evaporative coils, shell and tube, tube within a tube and fin and tube)
	c. Metering devices (such as adjusting automatic and thermostatic expansion valves, fixed orifices and other devices available on the local market)
15.02	Evaluate metering-device performance.
15.03	Explain the methods of compression, lubrication and compressor loading and unloading.
15.04	Analyze the operating condition of a compressor.
15.05	Test, troubleshoot and correct the causes of mechanical problems in a heating, air-conditioning and refrigeration system.
15.06	Identify the location and explain the uses of refrigerant flow accessories.
15.07	Identify the location and explain the uses of heating, air-conditioning and refrigeration-system accessories (such as receivers, dryers/filters, solenoid valves, heat exchangers, accumulators, suction filter, oil separators, evaporator pressure-regulating valve, crankcase pressure-regulating valves, hot gas bypass valves and check valves).
15.08	Evaluate system performance.
16.0	Select appropriate commercial compressors--The student will be able to:
16.01	Compare commercial-compressor requirements with those for residential and light commercial heating and air-conditioning systems.
16.02	Discuss appropriate commercial compressors for cooling requirements.
16.03	Describe the mechanical operation for each type of compressor.
16.04	Explain compressor lubrication methods.

16.05	Explain methods used to control compressor capacity.
16.06	Describe how compressor protection devices operate.
16.07	Perform the common procedures used when field servicing open and semi-hermetic compressors.
17.0	Test and adjust commercial evaporative condensers--The student will be able to:
17.01	Determine the proper air and fluid flow for commercial evaporative condensers.
17.02	Test and adjust the airflow for proper temperature difference.
17.03	Test and adjust the water flow for proper GPM and temperature difference.
17.04	Check for proper water treatment.
18.0	Maintain, test and troubleshoot commercial evaporators--The student will be able to:
18.01	Determine the operational requirements for evaporators used in commercial heating and air-conditioning applications.
18.02	Discuss appropriate evaporators for commercial heating and air-conditioning systems
18.03	Maintain, test and adjust various commercial heating and air-conditioning accessories.
18.04	Maintain, test and adjust commercial heating and air-conditioning accessories.
18.05	Compare commercial accessories with residential and light- commercial-heating and air-conditioning accessories.
18.06	Select the heating and air-conditioning accessories appropriate for various commercial applications.
19.0	Fabricate and service the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry--The student will be able to:
19.01	Identify and explain the purpose of the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
19.02	Bend tubing, using tube benders.

19.03	Connect tubing using flared fittings and compression fittings.
19.04	Connect tubing, using solderless connectors.
19.05	Connect tubing, using a swaged-joint connection.
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.
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 heating, air-conditioning, refrigerant and ventilation accessories.
19.13	Fabricate and leak-test the piping, tubing and fittings used in the heating, air-conditioning and refrigeration industry.
19.14	Demonstrate proper safety measures when fabricating and servicing piping, tubing and fittings.

**Course Number: ACR0047**  
**Occupational Completion Point:**  
**Air-Conditioning, Refrigeration and Heating Mechanic 1 – 250 Hours – SOC Code 49-9021**

20.0	Identify basic principles of heating, air conditioning, refrigeration and ventilation piping sizing--The student will be able to:
20.01	Identify and explain various types of heating, air-conditioning and refrigeration piping.
20.02	Identify basic principles of sizing various heating, air conditioning, refrigeration and ventilation for various tasks.
20.03	Explain pressure and temperature drops.

21.0	Utilize and operate mechanical refrigeration servicing and testing equipment--The student will be able to:
21.01	Identify the effects of superheat and sub-cooling on a system.
21.02	Identify and explain the functions of servicing and testing equipment (such as vacuum pumps, micron gauges, EPA-approved equipment, leak detectors and charging systems).
21.03	Operate a refrigerant recovery system.
21.04	Apply specific safety and recovery practices for refrigerants used in the industry.
21.05	Apply specific safety practices as they relate to handling and storing cylinders and materials.
21.06	Explain the standards for and ways to measure, test, maintain and evacuate a mechanical heating, air-conditioning and refrigeration system.
21.07	Evacuate the refrigerant system with various vacuum methods.
21.08	Demonstrate compliance with Environmental Protection Agency (EPA) rules and regulations and, if possible, take the EPA test.
21.09	Charge various air-conditioning and mechanical refrigeration systems by various methods.
21.10	Demonstrate the effects of superheat and sub-cooling on a system utilizing test equipment (such as thermometers and gages).
22.0	Assist in the installation of a residential heating and air-conditioning system and determine start-up procedures--The student will be able to:
22.01	Read and comply with dispatch orders.
22.02	Explain local codes and ordinances.
22.03	Select and use appropriate tools and safety practices to test equipment.
22.04	Determine the electrical requirements of equipment.
22.05	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.
22.06	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.

22.07	Determine the temperature split/ difference across the evaporator.
22.08	Determine the temperature split/ difference across the condenser.
22.09	Write a service report.
22.10	Apply good customer-relations skills.
23.0	Conduct start-up and check-out procedures for mechanical heating and air-conditioning systems--The student will be able to:
23.01	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.
23.02	Determine the start-up and checkout procedures recommended by different manufacturers.
23.03	Determine the electrical requirements of equipment.
23.04	Select and use appropriate tools, instruments and test equipment following safety precautions.
23.05	Determine the temperature split/ difference across the outdoor coil on a heat pump.
23.06	Determine the temperature split/ difference across the indoor coil on a heat pump.
23.07	Apply good customer-relations skills.
24.0	Demonstrate a working knowledge of refrigerants and oils--The student will be able to:
24.01	Identify the refrigerants in common use and state the types of applications in which each is used.
24.02	Explain the effects of releasing refrigerants into the atmosphere.
24.03	Explain how refrigerants are classified by their chemical composition.
24.04	Describe the color-coding scheme used to identify refrigerant cylinders.
24.05	Describe how azeotropes and near-azeotropes differ from each other and from so-called pure refrigerants.

24.06	Interpret a P-T chart for pure refrigerants, azeotrope, and near-azeotrope refrigerants and explain the difference between bubble point and dew point.
24.07	Demonstrate refrigerant leak detecting methods.
24.08	Identify the different types of oils used in refrigeration systems and explain their relationships to the various refrigerants.
24.09	Explain how to add and remove oil from a system.
24.10	Describe how to test oil for contamination.
25.0	Conduct system startup and shutdown--The student will be able to:
25.01	Start up and shut down an air handler and related forced-air distribution system.
25.02	Test compressor oil for acid contamination.
25.03	Add or remove oil from a semi-hermetic or open reciprocating compressor.
26.0	Explain the importance of employability and entrepreneurship skills--The student will be able to:
26.01	Identify and demonstrate positive work behaviors needed to be employable.
26.02	Develop personal career plan that includes goals, objectives and strategies.
26.03	Examine licensing, certification and industry credentialing requirements.
26.04	Maintain a career portfolio to document knowledge, skills and experience.
26.05	Evaluate and compare employment opportunities that match career goals.
26.06	Identify and exhibit traits for retaining employment.
26.07	Identify opportunities and research requirements for career advancement.
26.08	Research the benefits of ongoing professional development.

**Course Number: ACR0049**  
**Occupational Completion Point: C**  
**Air-Conditioning, Refrigeration and Heating Mechanic 2 – 250 Hours – SOC Code 49-9021**

27.0 Use combustion-type heating servicing and testing equipment--The student will be able to:

27.01 Explain combustion theory and the safety precautions for using combustion-type-heating servicing and testing equipment.

27.02 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).

27.03 Use the servicing and testing equipment.

27.04 Test, analyze and troubleshoot combustion-type-heating systems.

28.0 Troubleshoot combustion gas valves and regulators as used in heating, air-conditioning, refrigeration and ventilation systems--The student will be able to:

28.01 Identify and discuss the safety and regulation issues and concerns.

28.02 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).

28.03 Identify various types of gas valves and regulators.

28.04 Determine the application of gas valves and regulators.

28.05 Troubleshoot gas valves and regulators.

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 including a gas furnace and boiler, an oil furnace and boiler, an electric furnace, electric heaters, a heat pump and solar-heating systems.



30.0	Explain how to install, maintain and repair heating, air-conditioning and refrigeration systems--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	Explain how to lay out, construct and troubleshoot comfort systems.
30.04	Test and analyze systems.
30.05	Test and analyze heat-recovery systems.
31.0	Demonstrate knowledge of retail refrigeration systems--The student will be able to:
31.01	Describe the mechanical refrigeration cycle as it applies to retail refrigeration systems.
31.02	Explain the differences in refrigerants and applications in low-, medium- and high-temperature refrigeration systems.
31.03	Identify and describe the primary refrigeration cycle components used in retail refrigeration systems.
31.04	Identify and describe the supporting components and accessories used in retail refrigeration systems.
31.05	Describe the various methods of defrost used in retail refrigeration systems.
31.06	Identify and describe the applications for the various types of retail refrigeration systems.
31.07	Describe the control system components used in retail refrigeration systems.
31.08	Explain the operating sequence of a retail refrigeration system.
31.09	Interpret wiring diagrams and troubleshooting charts to isolate malfunctions in retail refrigeration systems.
32.0	Demonstrate knowledge of commercial and industrial refrigeration systems--The student will be able to:
32.01	Identify different types of refrigerated coolers and display cases and describe each one's common application.

32.02	Compare the basic components used in commercial/industrial refrigeration systems with those used in retail refrigeration systems.
32.03	Identify single, multiple and satellite compressor systems; describe the applications, installation considerations and advantages and disadvantages of each type.
32.04	Identify packaged condensing units and unit coolers; describe their applications, operation and installation considerations.
32.05	Identify two-stage compressors and explain their operation and applications.
32.06	Identify the various accessories used in commercial refrigeration systems and explain why each is used and where it should be installed in the system.
32.07	Identify the various refrigeration control devices and explain the purpose of each type and how it works.
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.

**Course Number: ACR0044**  
**Occupational Completion Point: D**  
**Air-Conditioning, Refrigeration and Heating Technician – 350 Hours – SOC Code 49-9021**

**Note: Students may choose one of the following courses for the completion of OCP D: 'Air-Conditioning, Refrigeration and Heating Technician' – ACR0044 or 'Refrigeration Technician' – ACR0045.**

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.

34.04 Discuss current issues and concerns (such as indoor-air quality, the ozone layer and computer technology) in the heating, air-conditioning and refrigeration industry and in the environment and explain their future ramifications.

34.05 Determine the properties of air, using a psychrometric chart.

34.06 Follow safety precautions.

34.07 Identify and explain the different types and benefits of air-filtration systems, air-handling systems and ventilation systems.

34.08 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 Define indoor-air quality.

36.02 Identify and explain the codes and standards regarding indoor-air quality.

36.03	Select and use indoor-air-quality measuring devices.
36.04	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.
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	Read construction documents--The student will be able to:

40.01	Recognize and identify basic construction drawing terms, components and symbols.
40.02	Relate information on construction drawings to actual locations on the print.
40.03	Recognize different classifications of construction drawings.
40.04	Interpret and use drawing dimensions.
41.0	Interpret, use and modify construction drawings and specifications--The student will be able to:
41.01	Read mechanical plans within a set of construction drawings explain their relationship.
41.02	Compare mechanical plans with the actual installation of duct and pipe runs, fittings and sections.
41.03	Interpret specification documents and apply them to the plans.
41.04	Interpret shop drawings and apply them to the plans and specifications.
41.05	Develop a field set of as-built drawings.
41.06	Identify the steps required for transferring design information to component production.
41.07	List and classify materials most commonly used in HVAC systems.
42.0	Design heating and cooling systems--The student will be able to:
42.01	Identify and describe the steps in the system design process.
42.02	Use construction drawings or an actual job site to obtain information needed to complete heating and cooling load estimates.
42.03	Identify the factors that affect heat gains and losses to a building and describe how these factors influence the design process.
42.04	Complete a load estimate to determine the heating and/or cooling load of a building.
42.05	State the principles that affect the selection of equipment to satisfy the calculated heating and/or cooling load.

42.06	Select heating and/or cooling equipment using manufacturers' product data.
42.07	Identify the various types of duct systems and explain why and where each type is used.
42.08	Demonstrate the effect of fittings and transitions on duct system design.
42.09	Use a friction loss chart and duct sizing table to size duct.
42.10	Install insulation and vapor barriers used in duct systems.
42.11	Select and install refrigerant and condensate piping following proper design principles.
43.0	Troubleshoot and repair commercial heating and air-conditioning systems--The student will be able to:
43.01	Keep a record of the installation, maintenance and repair of commercial heating and air-conditioning systems.
43.02	Apply local and national codes and safety practices.
43.03	Lay out a commercial heating and air-conditioning system.
43.04	Lay out a typical split commercial air-conditioning system.
43.05	Lay out a typical split commercial heating system.
43.06	Maintain, test, analyze and repair various types of commercial heating and air-conditioning systems.
43.07	Maintain, troubleshoot and repair water-cooled condensers
44.0	Calculate commercial heating and air-conditioning loads--The student will be able to:
44.01	Explain conduction as a heat-load source.
44.02	Describe the implications of conducting and the resistance values for different types of construction materials.
44.03	Interpret heat-transfer tables and define values U, K, C and R.

44.04	Locate the total heat-transfer value of any surface.
44.05	Explain infiltration and exfiltration/ventilation as a heat-load source.
44.06	Explain a product heat-load source.
44.07	Explain miscellaneous loads (people, motors and equipment) as heat-load sources.
44.08	Explain the purpose of vapor barriers.
44.09	Interpret tables of specific heat values as applied to commercial heating and air-conditioning systems.
44.10	Calculate and design systems.
44.11	Calculate cooling and heating equipment sizes.
44.12	Design and identify methods of installing air-movement systems.
45.0	Install air distribution systems--The student will be able to:
45.01	Describe airflow and pressures in a basic forced-air distribution system.
45.02	Explain the differences between propeller and centrifugal fans and blowers.
45.03	Identify the various types of duct systems and explain why and where each type is used.
45.04	Demonstrate or explain the installation of metal, fiberboard and flexible duct.
45.05	Demonstrate or explain the installation of fittings and transitions used in duct systems.
45.06	Identify and explain the operations of electrical control systems and their components (zone damper motors).
45.07	Demonstrate or explain the use and installation of dampers used in duct systems.
45.08	Demonstrate or explain the use and installation of insulation and vapor barriers used in duct systems.

45.09	Identify instruments used to make measurements in air systems and explain the use of each instrument.
45.10	Make basic temperature, air pressure and velocity measurements in an air distribution system.
46.0	Evaluate commercial airside systems--The student will be able to:
46.01	Identify the differences in various types of commercial all-air systems.
46.02	Identify the type of building in which a particular type of system is used.
46.03	Explain the typical range of capacities for a commercial air system.
47.0	Balance an air distribution system--The student will be able to:
47.01	Explain the fan and pump laws.
47.02	Use a psychrometric chart to evaluate air properties and changes in air properties.
47.03	Explain the principles involved in the balancing of air and water distribution systems.
47.04	Define common terms used by manufacturers when describing grilles, registers and diffusers.
47.05	Identify and use the tools and instruments needed to balance air distribution systems.
47.06	Change the speed of an air distribution system supply fan.
48.0	Select energy conservation equipment--The student will be able to:
48.01	Identify and explain the operation of energy conservation equipment.
48.02	Operate selected energy conservation equipment.
49.0	Analyze building management systems--The student will be able to:
49.01	Identify the major components of a building management system and describe how they fit together.



49.02	Explain a basic direct digital controller.
50.0	Recommend alternative heating and cooling systems for various case studies--The student will be able to:
50.01	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.
50.02	Describe alternative technologies for heating such as ductless systems, computer rooms, chilled beams and multi-zone.

**Course Number: ACR0045**  
**Occupational Completion Point: D**  
**Refrigeration Mechanic – 350 Hours – SOC Code 49-9021**

**Note: Students may choose one of the following courses for the completion of OCP D: 'Air-Conditioning, Refrigeration and Heating Technician' – ACR0044 or 'Refrigeration Technician' – ACR0045.**

51.0	Demonstrate a working knowledge of electrical generation and distribution components for commercial heating and air conditioning systems--The student will be able to:
51.01	Calculate loads and design and lay out a commercial refrigeration system.
51.02	Identify and explain commercial refrigeration-pressure-regulation devices, controls and components.
51.03	Install, service and repair ice machines and specialty refrigeration systems.
51.04	Test and troubleshoot refrigerant-pressure-regulating devices, controls and components.
51.05	Apply local and national codes and mechanical safety practices.
52.0	Demonstrate a working knowledge of refrigeration-system vibration and insulation--The student will be able to:
52.01	Describe the applications of vibration eliminators.
52.02	Identify and select the correct insulation for commercial application.
53.0	Apply commercial refrigeration-pipe sizing and troubleshooting procedures--The student will be able to:

53.01	Determine the capacities of refrigerant lines, including the amounts they will hold, equivalent lengths of fittings and the total effective length for various pipelines.
53.02	Identify and apply industry-approved installation procedures.
53.03	Troubleshoot refrigeration-pipe-sizing problems.
a.	Explain the use of traps in suction-line risers.
b.	Explain pressure drop.
c.	Calculate pressure drop in liquid-line risers.
d.	Size double risers, hot-gas lines and liquid lines from condenser to receiver.
54.0	Use refrigeration-systems skills in commercial applications--The student will be able to:
54.01	Identify and apply the safety practices used with commercial refrigeration systems.
54.02	Apply refrigeration-systems skills to commercial refrigeration systems.
a.	Perform dehydration, evacuation and recovery procedures.
b.	Interpret blueprints and mechanical drawings.
c.	Service and charge a refrigeration system.
d.	Test, analyze and replace compressors.
e.	Retrofit alternative refrigerants and oils.
55.0	Demonstrate a working knowledge of refrigerated storage systems--The student will be able to:
55.01	Identify and differentiate among various types of cases, such as service cases and self-service cases.
55.02	Explain the operation of air-screen freezers, glass-door freezers, coffin cases and walk-in coolers.

55.03	Differentiate among medium-temperature, low-temperature and ultralow-temperature systems.
55.04	Explain various defrost methods.
55.05	Maintain, test and troubleshoot defrost components.
55.06	Identify and explain the components of various refrigerated storage systems.
55.07	Maintain, test and troubleshoot various refrigerated storage system components.
56.0	Diagnose, maintain and repair ice-making systems--The student will be able to:
56.01	Identify and explain various types and operations of ice-making systems.
56.02	Maintain, test, troubleshoot and repair various types of ice-making systems, following the manufacturers' recommendations.
56.03	Identify and explain the different types of water-treatment methods and systems.
56.04	Analyze water to identify water problems and the proper treatments.
57.0	Use refrigeration electrical-system skills in commercial applications--The student will be able to:
57.01	Apply electrical safety practices for commercial refrigeration systems.
57.02	Apply refrigeration electrical-system skills to commercial refrigeration systems:
	a. Interpret symbols of electrical components and diagrams.
	b. Interpret schematics and diagrams.
	c. Apply electrical theory and calculations.
	d. Explain the principles of designing electrical systems.

e. Test and troubleshoot single- and three-phase motors and variable speed electronic commutated motors (ECM).

57.03 Test the solid-state components used in commercial refrigeration systems.

57.04 Troubleshoot and diagnose the electrical circuits used in commercial refrigeration systems.

57.05 Test and troubleshoot the thermostatic controls used in commercial refrigeration systems.

58.0 Maintain and troubleshoot commercial refrigeration systems--The student will be able to:

58.01 Follow appropriate safety precautions for commercial refrigeration systems.

58.02 Identify and explain the operations of various types of commercial refrigeration systems and applications, such as single, multiplex and cascade systems.

58.03 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.

### **Special Notes**

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

### **Career and Technical Student Organization (CTSO)**

SkillsUSA is the intercultural 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 (if applicable)**

In PSAV 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: Mathematics 10, Language 9, and Reading 9. 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(7), 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(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

## **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.