

Florida Department of Education
Curriculum Framework

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

Secondary – Career Preparatory

Program Number	8727200
CIP Number	0646030200
Grade Level	9-12
Standard Length	8 Credits
Teacher Certification	Refer to the Program Structure section.
CTSO	SkillsUSA
SOC Codes (all applicable)	47-3013 -- Helpers--Electricians 47-2111 -- Electricians
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this program is to prepare students for employment or advanced training in a variety of electrical construction industries.

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

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

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

Program Structure

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

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

The following table illustrates the secondary program structure:

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

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics)

Common Career Technical Core – Career Ready Practices

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

1. Act as a responsible and contributing citizen and employee.
2. Apply appropriate academic and technical skills.
3. Attend to personal health and financial well-being.
4. Communicate clearly, effectively and with reason.
5. Consider the environmental, social and economic impacts of decisions.
6. Demonstrate creativity and innovation.
7. Employ valid and reliable research strategies.
8. Utilize critical thinking to make sense of problems and persevere in solving them.
9. Model integrity, ethical leadership and effective management.
10. Plan education and career path aligned to personal goals.
11. Use technology to enhance productivity.
12. Work productively in teams while using cultural/global competence.

Standards

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

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

Florida Department of Education
Student Performance Standards

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

Course Description:

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

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

CTE Standards and Benchmarks	
	<ul style="list-style-type: none"> 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:
03.01	Define the following terms: voltage, current, resistance and power.
03.02	Measure voltage, current and resistance using industry standard electrical measuring devices.
03.03	Analyze and explain series, parallel, and series parallel (combination) circuits.
03.04	Draw each type of circuit and calculate the circuit values.
03.05	Explain and apply Ohm's Law.
03.06	Compute conductance and resistance of conductors.
04.0	Apply mathematics knowledge and skills to electricity--The student will be able to:
04.01	Demonstrate knowledge of arithmetic operations.
04.02	Analyze and apply data and measurements to solve problems and interpret documents.
04.03	Construct charts, tables and graphs using functions and data.
05.0	Demonstrate an understanding of basic electricity--The student will be able to:
05.01	Relate electricity to the nature of matter.
05.02	Describe various ways that electricity is produced.
05.03	Explain the magnetic properties of circuits and devices.
05.04	Explain the principles of electromagnetism.
06.0	Read and interpret basic electric codes--The student will be able to:
06.01	Describe the importance of following the local, state and national electric codes.
06.02	Read and interpret basic electric codes, wiring plans and specifications.
06.03	Identify licensure requirements for electrical occupations.

CTE Standards and Benchmarks

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

Florida Department of Education
 Student Performance Standards

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

Course Description:

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

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

Florida Department of Education
Student Performance Standards

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

Course Description:

This course provides students with electrical math skills.

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

**Florida Department of Education
Student Performance Standards**

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

Course Description:

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

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

CTE Standards and Benchmarks

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

Florida Department of Education
 Student Performance Standards

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

Course Description:

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

CTE Standards and Benchmarks

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

Florida Department of Education
Student Performance Standards

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

Course Description:

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

CTE Standards and Benchmarks	
14.0	Install residential wiring systems--The student will be able to:
14.01	Install and wire a low voltage signal system.
14.02	Install conduit systems.
14.03	Provide power for Heating, Ventilation and Air Conditioning (HVAC) equipment.
14.04	Install the following, complying with the appropriate local, state and national electric codes: <ul style="list-style-type: none"> a. Service entrance main panel. b. Service entrance meter base. c. Alarm systems and smoke detectors.
14.05	Demonstrate knowledge of the requirements for the installation of a swimming pool electrical system.
14.06	Connect single-phase and three-phase transformers.
14.07	Troubleshoot residential electric circuits.

Florida Department of Education
Student Performance Standards

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

Course Description:

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

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

Florida Department of Education
Student Performance Standards

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

Course Description:

This course enables students to develop specialized skills in electricity.

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

Additional Information

Laboratory Activities

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

Florida Standards for English Language Development (ELD)

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

English Language Development (ELD) Standards Special Notes:

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

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.

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

Additional Resources

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