Florida Department of Education
Curriculum Framework

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

Career Certificate Program		
Program Number	I460314	
CIP Number	0646030204	
Grade Level	30,31	
Standard Length	1500 Hours	
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	
Basic Skills Level	Mathematics: 9	Communications (Reading and Language Arts): 9

Purpose

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

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Architecture and Construction career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Architecture and Construction career cluster. The content includes but is not limited to planning and installing electrical wiring, equipment, or fixtures based on job specifications and local codes.

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

Program Structure

This program is a planned sequence of instruction consisting of four occupational completion points. The recommended sequence allows students to complete specified portions of a program for employment or to remain for advanced training. A student who completes the applicable competencies at any occupational completion point may either continue with the training program or terminate as an occupational completer.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44(3)(b), F.S.

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

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code
A	BCV0603	Electrician Helper	ELECTRICAL @7 7G IND ENGR 7G TEC ED 1@2 ENG&TEC ED1@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 analytical and trouble shooting skills related to electrical principles.
10.0 Demonstrate proficiency in electrical math problems and skills.
11.0 Demonstrate an understanding of Alternating Current (AC) circuit skills.
12.0 Explain the importance of employability and entrepreneurship skills.
13.0 Install residential wiring.
14.0 Install residential wiring systems.
15.0 Demonstrate proficiency in commercial wiring.
16.0 Demonstrate specialized electrical skills.
17.0 Demonstrate competency in industrial wiring.
18.0 Demonstrate competency in Alternating Current (AC) and Direct Current (DC) motors.
19.0 Demonstrate competency in electrical and electronic control circuits and equipment.

Florida Department of Education
Student Performance Standards

Program Title: Electrician
Career Certificate Program Number: I460314

Course Number: BCV0603 **Occupational Completion Point: A** **Electrician Helper – 300 Hours – SOC Code 47-3013**	
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 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, amperage and resistance using industry standard electrical measuring devices.
	03.03 Analyze and explain series, parallel, and series parallel (combination) circuits.
	03.04 Draw each type of circuit and calculate the circuit values.
	03.05 Explain and apply Ohm's Law.
	03.06 Compute conductance and resistance of conductors.
04.0	Apply mathematics knowledge and skills to electricity--The student will be able to:
	04.01 Demonstrate knowledge of arithmetic operations.
	04.02 Analyze and apply data and measurements to solve problems and interpret documents.
	04.03 Construct charts, tables and graphs using functions and data.
05.0	Demonstrate an understanding of basic electricity--The student will be able to:
	05.01 Relate electricity to the nature of matter.
	05.02 Describe various ways that electricity is produced.
	05.03 Explain the magnetic properties of circuits and devices.
	05.04 Explain the principles of electromagnetism.
06.0	Read and interpret basic electric codes--The student will be able to:
	06.01 Describe the importance of following the local, state and national electric codes.
	06.02 Read and interpret basic electric codes, wiring plans and specifications.
	06.03 Identify licensure requirements for electrical occupations.
	06.04 Demonstrate knowledge of National Fire Protection Association (NFPA) 70E and how it relates to job safety.
07.0	Apply further mathematics knowledge and skills to electricity--The student will be able to:
	07.01 Demonstrate and solve basic algebraic formulas related to electricity.
	07.02 Solve basic trigonometric functions related to electrical theory.

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

Course Number: BCV0640 Occupational Completion Point: B Residential Electrician – 450 Hours -- 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 Calculate voltage drop.
	10.03 Determine ampacity correction factors.
	10.04 Calculate conduit fill.
	10.05 Calculate box fill.
	10.06 Calculate range loads.
11.0	Demonstrate an understanding of Alternating Current (AC) circuit skills--The student will be able to:
	11.01 Identify the physical and electrical characteristics of capacitors and inductors.
	11.02 Demonstrate proficiency in measuring, testing and connecting a transformer.
	11.03 Analyze and apply the principles of transformers to AC circuits.
	11.04 Identify the properties of an AC signal. (optional)
	11.05 Identify AC sources.
12.0	Explain the importance of employability and entrepreneurship skills--The student will be able to:
	12.01 Identify and demonstrate positive work behaviors needed to be employable.

	12.02 Develop personal career plan that includes goals, objectives and strategies.
	12.03 Examine licensing, certification and industry credentialing requirements.
	12.04 Maintain a career portfolio to document knowledge, skills and experience.
	12.05 Evaluate and compare employment opportunities that match career goals.
	12.06 Identify and exhibit traits for retaining employment.
	12.07 Identify opportunities and describe requirements for career advancement.
	12.08 Describe the benefits of ongoing professional development.
	12.09 Examine and describe entrepreneurship opportunities as a career planning option.
13.0	Install residential wiring--The student will be able to:
	13.01 Identify residential-wiring requirements and specifications in accordance with a wiring plan.
	13.02 Identify electrical symbols in construction documents.
	13.03 Draw a residential wiring plan, using electrical wiring symbols.
	13.04 Identify and install a recessed lighting fixture, a fluorescent lighting fixture and a surface lighting fixture according to the specifications, complying with the appropriate local, state and national electric codes.
	13.05 Identify, install and wire a duplex receptacle outlet circuit, a split circuit duplex receptacle outlet circuit, and a special purpose receptacle outlet circuit, a Ground Fault Circuit Interrupter (GFCI) receptacle or circuit, and an Arc Fault Circuit Interrupter (AFCI) receptacle or circuit, according to the specifications, complying with the appropriate local, state and national electric codes.
14.0	Install residential wiring systems--The student will be able to:
	14.01 Install and wire a low voltage signal system.
	14.02 Install conduit systems.
	14.03 Provide power for Heating, Ventilation and Air Conditioning (HVAC) equipment.
	14.04 Install the following, complying with the appropriate local, state and national electric codes: 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.

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 and materials to complete a job.
15.04	Install or identify 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	Describe poly-(three)-phase circuits.
15.07	Install a simple poly-(three)-phase circuit.
15.08	Construct control circuits from schematics.
15.09	Describe high voltage (over 1000 volts) wiring requirements.
15.10	Demonstrate a general knowledge of hazardous locations and wiring methods.
15.11	Explain a commercial three-phase receptacle circuit and an emergency lighting system.
15.12	Explain commercial service entrance requirements.
16.0	Demonstrate specialized electrical skills--The student will be able to:
16.01	Demonstrate an understanding of solid state control devices such as Variable Frequency Drives (VFD's), electronic ballast, electronic motor starters, motion sensors, etc.
16.02	Demonstrate an understanding of data cable installation according to the plans and specifications.
16.03	Demonstrate an understanding of the basic concepts of grounding and bonding.

Course Number: BCV0667 **Occupational Completion Point: D** **Industrial Electrician – 300 Hours – 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 volt lighting branch circuit.
17.06	Describe a bus duct power distribution system.
17.07	Describe fiber optic installation requirements.
17.08	Demonstrate the use of industrial test equipment.
17.09	Install the following: a. Disconnect switch, fused and unfused b. Raceways c. Emergency stop switch d. Circuit breaker e. Panel board
17.10	Explain the basic principles of mutual induction and transformer action.
17.11	Explain the operation and use of a current transformer.
17.12	Explain the operation and use of a potential transformer.
17.13	Explain the operation and use of a buck boost transformer and when it is used.
17.14	Explain and connect three-phase transformers in both delta and wye configuration.
17.15	Calculate the over current protection requirements for the primary and secondary.
17.16	Explain what transformer impedance is and its importance.
18.0	Demonstrate competency in Alternating Current (AC) and Direct Current (DC) motors--The student will be able to:
18.01	Install and connect the following types of DC motors: 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.

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 a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91.

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.

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