Florida Department of Education
CURRICULUM FRAMEWORK

Cluster Title:	Electrical Trades
Program Type:	Job Preparatory
Occupational Area:	Industrial Education
Components	Cluster with three programs eight Occupational Completion Points
Facility Code	203
CTSO	SkillsUSA-VICA
Co-op Method	Yes
Apprenticeship	Yes

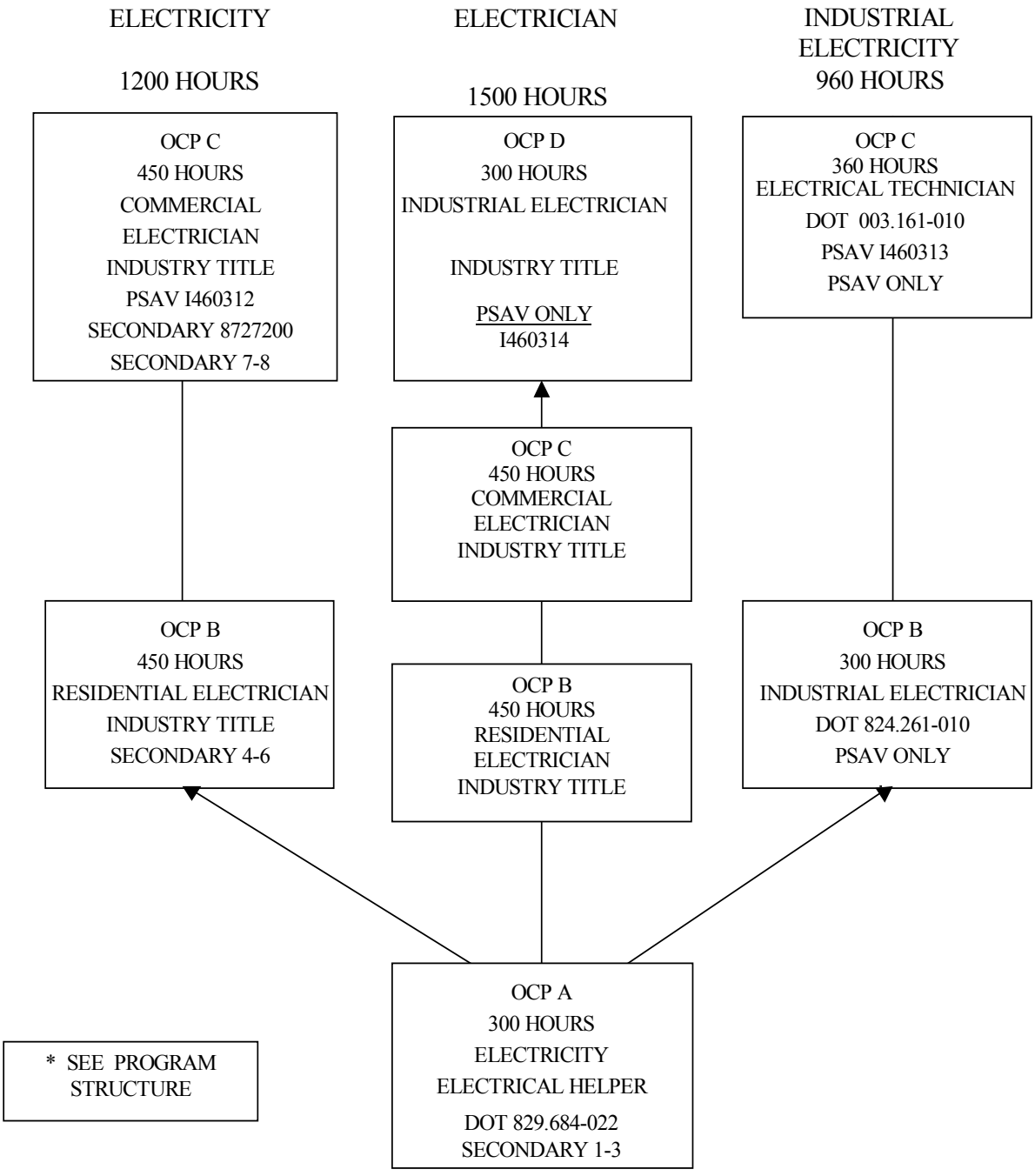
I. PURPOSE: The purpose of this program is to prepare students for employment or advanced training in a variety of construction electrical industries.

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.

II. PROGRAM STRUCTURE: These three (3)programs have a planned sequence of instruction consisting of a core and a total of seven 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. * Industrial Electrician (PSAV only) is a combination program, which includes residential commercial and a portion of the industrial electricity program; it does not include PLC (programmable logic controls).

THE FOLLOWING DIAGRAM ILLUSTRATES
THE PROGRAM STRUCTURE

ELECTRICAL TRADES



At the secondary level, the (Residential-Commercial) Electricity program consists of the following courses:

8727210 - Electricity 1	(150)		
8727220 - Electricity 2	(150)	[300]	OCP A
8727230 - Electricity 3	(150)		
8727240 - Electricity 4	(150)		
8727250 - Electricity 5	(150)	[450]	OCP B
8727260 - Electricity 6	(150)		
8727270 - Electricity 7	(150)		
8727280 - Electricity 8	(150)	[450]	OCP C

III. LABORATORY ACTIVITIES: Classroom, shop, and laboratory activities are an integral part of this program. These activities include instruction in the use of the safety procedures, tools, equipment, materials, and processes found in the industry. A generic equipment list for this program is available.

IV. **SPECIAL NOTE: SkillsUSA**-VICA, Inc. is the appropriate Career and Technical Student Organization (CTSO) for providing leadership training and for reinforcing specific career and technical skills. Career and Technical Student Organizations, when provided, shall be an integral part of the career and technical instructional program, and the activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, FAC.

The program may be offered in Postsecondary adult vocational (PSAV) courses. Vocational credit shall be awarded to the student on a transcript in accordance with Section 230.643, F.S.

Cooperative training - OJT is appropriate for this program. Whenever cooperative training - OJT is offered, the following are required for each student: a training plan, signed by the student, teacher, and employer, which includes instructional objectives and a list of on-the-job and in-school learning experiences; a workstation that reflects equipment, skills and tasks that are relevant to the occupation which the student has chosen as a career goal. The student must receive compensation for work performed.

In accordance with Rule 6A-10.040, FAC, the minimum basic-skills grade levels required for adult vocational students to exit this program are: Mathematics 9.0, Language 9.0, Reading 9.0 These grade-level numbers correspond to grade-equivalent scores obtained on one of the state-designated basic-skills examinations. If a student does not meet the basic-skills level required for completion of the program, remediation should be provided concurrently through Vocational Preparatory Instruction (VPI). Please refer to the Rule for exemptions.

SCANS Competencies: Instructional strategies for this program must include methods that require students to identify, organize, and use resources appropriately; to work with each other cooperatively and productively; to acquire and use information; to understand social, organizational, and technological systems; and to work with a variety of tools and equipment. Instructional strategies must also incorporate the methods to improve students' personal qualities and high-order thinking skills.

To be transferable statewide between institutions, this program/course must have been reviewed, and a "transfer value" assigned the curriculum content by the appropriate Statewide Course Numbering System discipline committee. This does not preclude institutions from developing specific program or course articulation agreements with each other.

When a secondary student with a disability is enrolled in a vocational class with modifications to the curriculum framework, the particular outcomes and student performance standards which, the student must master to earn credit must be specified on an individual basis. The job or jobs for which the student is being trained should be reflected in the student's desired postschool outcome statement on the Transition Individual Educational Plan (Transition IEP).

The standard length of the residential, commercial electricity program is 1,200 hours.
The standard length of the industrial electricity program is 960 hours.
The standard length of the electrician program is 1500 hours. See program structure.

Florida Department of Education
INTENDED OUTCOMES

Program Title: Electricity

	Secondary	PSAV
Program Number	8727200	I460312
CIP Number	0646.030202	0646.030202
Grade Level	9-12, 30, 31	30, 31
Length	8 Credits	1200 Hours
Certification	ELECTRICAL @7 G	ELECTRICAL @7 G
Basic Skills		
Math		9
Language		9
Reading		9

INTENDED OUTCOMES: After successfully completing appropriate course(s) for each occupational completion point of this program, the student will be able to perform the following:

OCCUPATIONAL COMPLETION POINT - DATA - A (300 hours)
ELECTRICIAN HELPER - DOT CODE 829.684-022

01.0 Identify safe working conditions at the laboratory and workplace, and observe safety precautions.
02.0 Demonstrate an understanding of basic direct-current (DC) electrical-circuit skills.
03.0 Demonstrate appropriate communication skills.
04.0 Apply electricity-related basic math.
05.0 Demonstrate an understanding of basic electricity.
06.0 Demonstrate employability skills.
07.0 Read and interpret basic electric codes.
08.0 Demonstrate an understanding of entrepreneurship.
09.0 Demonstrate positive customer-relations skills.

OCCUPATIONAL COMPLETION POINT - DATA CODE - B (450 hours)
RESIDENTIAL ELECTRICIAN - INDUSTRY TITLE

10.0 Demonstrate proficiency in electrical math problems.
11.0 Demonstrate alternating-current (AC) circuit skills.
12.0 Install residential wiring.

OCCUPATIONAL COMPLETION POINT - DATA CODE - C (450 hours)
COMMERCIAL ELECTRICIAN - INDUSTRY TITLE

13.0 Demonstrate proficiency in commercial wiring.
14.0 Demonstrate specialized electrical skills.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Program Title: Electricity
Secondary Number: 8727200
Postsecondary Number: I460312

OCCUPATIONAL COMPLETION POINT - DATA CODE - A
ELECTRICIAN HELPER - DOT Code 829.684-022

01.0 IDENTIFY SAFE WORKING CONDITIONS AT THE LABORATORY AND WORKPLACE, AND OBSERVE SAFETY PRECAUTIONS--The student will be able to:

01.01 Clean the work area and maintain it in a safe condition.
01.02 Apply lab policies and procedures for safety, including fire safety.
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 Demonstrate procedures for disaster situations.
01.06 Demonstrate the proper use and care of hand and power tools and equipment.
01.07 Demonstrate knowledge of CPR (cardiopulmonary resuscitation) and first aid.
01.08 Troubleshoot residential electric circuits.
01.09 Drill holes in metal, wood, and concrete for electrical wiring.
01.10 Identify and select tools, equipment, materials, and wires to complete a job.
01.11 Lay out electrical devices, complying with regulations.
01.12 Install the following, complying with the appropriate local, state, or national electric codes:
a. Conductors and cable
b. Standard outlets and switch boxes
c. Explain cord connections on major appliances
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.

02.0 DEMONSTRATE AN UNDERSTANDING OF BASIC DIRECT-CURRENT (DC) ELECTRICAL-CIRCUIT SKILLS--The student will be able to:

02.01 Define the terms "voltage," "current," "resistance," "power," and "energy."
02.02 Measure voltage, amperage, and resistance, using a volt-ohm meter (VOM) and a digital volt-ohm meter (DVM).
02.03 Analyze, and explain a series, series-parallel, and parallel circuit.
02.04 Draw each type of circuit and calculate the circuit values.
02.05 Explain and apply Ohm's Law.
02.06 Compute conductance and resistance of conductors and insulators.
02.07 Read and interpret color codes to identify resistors.
02.08 Explain voltage dividers (loaded and unloaded).

03.0 DEMONSTRATE APPROPRIATE COMMUNICATION SKILLS--The student will be able to:

03.01 Ask and answer questions coherently and concisely.
03.02 Read and follow written instructions and listen to and follow oral instructions.
03.03 Give reports orally and in writing.
03.04 Read critically in order to recognize assumptions and implications and to evaluate ideas.
03.05 Find job-related information in technical literature such as a manufacturer's manual.
03.06 Read and interpret the graphs, charts, diagrams and tables commonly used in this industry/occupation area.
03.07 Communicate job-related information with other trades.
03.08 Demonstrate appropriate telephone communication skills.
03.09 Identify the parts and functions of a computer system.
03.10 Identify the uses of the computer, including applications of the computer in the school, home and business.
03.11 Perform computer activities by preparing documents with the use of word-processing or database-applications software.

04.0 APPLY ELECTRICITY-RELATED BASIC MATH--The student will be able to:

04.01 Solve basic-math problems related to electrical work.
04.02 Convert units of measurement between the English system and the metric system.
04.03 Use scientific notation.
04.04 Demonstrate proficiency with a calculator.
04.05 Solve basic algebraic formulas related to electricity.
04.06 Solve basic trigonometric functions related to electrical theory.
04.07 Explain basic AC theory and solve related mathematical problems using appropriate test equipment.
04.08 Solve math-related problems from measurements on training aids. (Optional)

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.
05.05 Explain molecular action as a result of temperature extremes, chemical reaction, and moisture content.
05.06 Draw conclusions or make inferences from data.
05.07 Explain how voltage is produced by chemical, mechanical, thermal, photoelectric, and piezo electric means.
05.08 Identify blueprint symbols.

06.0 DEMONSTRATE EMPLOYABILITY SKILLS--The student will be able to:

06.01 Conduct a job search and identify career-growth and advanced-training opportunities, including apprenticeship programs.
06.02 Secure information about a job.
06.03 Identify documents that may be required for a job application.
06.04 Complete a job-application form.

06.05 Demonstrate competence in job-interview techniques.
06.06 Demonstrate productive work habits and positive attitudes.
06.07 Demonstrate knowledge of how to make job changes appropriately.
06.08 Identify ethical practices and responsibilities.
06.09 Demonstrate acceptable personal and professional hygiene.
06.10 Apply the principles of time management, work simplification, and teamwork when performing assigned tasks.
06.11 Explain the importance of taking pride in the quality of work performed.
06.12 Describe the importance of a drug-free workplace and the industry's policies toward drug use.
06.13 Describe the ramifications of a poor-driving record on employability opportunities and maintain a good driver's record.
06.14 Describe "Florida's Right-to-Know" Law as recorded in Florida Statutes, Chapter 442.

07.0 READ AND INTERPRET BASIC ELECTRIC CODES--The student will be able to:

07.01 Describe the importance of following the local, state and national electric codes.
07.02 Read and interpret basic electric codes, wiring plans and specifications.
07.03 Identify licensure requirements for electrical occupations.

08.0 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP--The student will be able to:

08.01 Define "entrepreneurship."
08.02 Describe the importance of entrepreneurship to the American economy and the role of small business in the free-enterprise system.
08.03 List the advantages and disadvantages of business ownership.
08.04 Identify the risks involved in the ownership of a business.
08.05 Identify the personal characteristics of a successful entrepreneur.
08.06 Identify the business skills (including computer skills) needed to operate a small business efficiently and effectively.

09.0 DEMONSTRATE POSITIVE CUSTOMER-RELATIONS SKILLS--The student will be able to:

09.01 Exercise self-control.
09.02 Identify and demonstrate appropriate responses to criticism.
09.03 Recognize basic human-relations skills as they relate to success in the electrical industry.
09.04 Resolve customer complaints in a positive, professional manner.
09.05 Demonstrate respect for customer property by cleaning the work area after duties are completed.

OCCUPATIONAL COMPLETION POINT - DATA CODE - B
RESIDENTIAL ELECTRICIAN - Industry Title

10.0 DEMONSTRATE PROFICIENCY IN ELECTRICAL MATH 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 INSTALL RESIDENTIAL WIRING--The student will be able to:

12.01 Identify residential-wiring requirements and specifications in accordance with a wiring plan.
12.02 Draw a residential wiring plan, using electrical-wiring symbols.
12.03 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.
12.04 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.
12.05 Install and wire a low-voltage signal system.
12.06 Install conduit systems.
12.07 Provide power for heating, ventilation, and air-conditioning equipment.
12.08 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
12.09 Demonstrate knowledge of the requirements for the installation of a swimming-pool electrical system.
12.10 Connect single-phase and three-phase transformers.

OCCUPATIONAL COMPLETION POINT - DATA CODE - C
COMMERCIAL ELECTRICIAN - Industry Title

13.0 DEMONSTRATE PROFICIENCY IN COMMERCIAL WIRING--The student will be able to:

13.01 Read and interpret a commercial wiring plan and specifications.
13.02 Draw a commercial electrical-wiring plan.
13.03 Select tools, equipment, materials, and wires to complete a job.

13.04 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
13.05 Describe the difference between a residential and a commercial lighting circuit.
13.06 Construct control circuits from schematics.
13.07 Describe high-voltage (over 600V) wiring requirements.
13.08 Demonstrate knowledge of installing wiring in hazardous areas.
13.09 Explain a commercial three-phase receptacle circuit, and an emergency-lighting system.
13.10 Explain commercial-service-entrance requirements.

14.0 DEMONSTRATE SPECIALIZED ELECTRICAL SKILLS--The student will be able to:

14.01 Explain solid-state control devices.
14.02 Explain data cable installation according to the plan and specifications.
14.03 Discuss fiber-optics installation requirements.

Florida Department of Education
INTENDED OUTCOMES

Program Title:	Electrician
	PSAV
Program Number	I460314
CIP Number	0646030204
Grade Level	30, 31
Length	1500 Hours
Certification	ELECTRICAL @7 G
Basic Skills	
Math	9
Language	9
Reading	9

INTENDED OUTCOMES: After successfully completing appropriate course(s) for each occupational completion point of this program, the student will be able to perform the following:

OCCUPATIONAL COMPLETION POINT - DATA - A (300 hours)
ELECTRICIAN HELPER - DOT CODE 829.684-022

01.0 Identify safe working conditions at the laboratory and workplace, and observe safety precautions.
02.0 Demonstrate an understanding of basic direct-current (DC) electrical-circuit skills.
03.0 Demonstrate appropriate communication skills.
04.0 Apply electricity-related basic math.
05.0 Demonstrate an understanding of basic electricity.
06.0 Demonstrate employability skills.
07.0 Read and interpret basic electric codes.
08.0 Demonstrate an understanding of entrepreneurship.
09.0 Demonstrate positive customer-relations skills.

OCCUPATIONAL COMPLETION POINT - DATA CODE - B (450 hours)
RESIDENTIAL ELECTRICIAN - INDUSTRY TITLE

10.0 Demonstrate proficiency in electrical math problems.
11.0 Demonstrate alternating-current (AC) circuit skills.
12.0 Install residential wiring.

OCCUPATIONAL COMPLETION POINT - DATA CODE - C (450 hours)
COMMERCIAL ELECTRICIAN - INDUSTRY TITLE

13.0 Demonstrate proficiency in commercial wiring.
14.0 Demonstrate specialized electrical skills.

OCCUPATIONAL COMPLETION POINT - DATA CODE - D (300 hours)
INDUSTRIAL ELECTRICIAN – INDUSTRY TITLE

15.0 Demonstrate competency in industrial wiring.
16.0 Demonstrate competency in transformers.
17.0 Demonstrate competency in AC and DC motors.
18.0 Demonstrate competency in electrical and electronic control circuits and equipment.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Program Title: Electrician
Postsecondary Number: I460314

OCCUPATIONAL COMPLETION POINT - DATA CODE - A
ELECTRICIAN HELPER - DOT Code 829.684-022

01.0 IDENTIFY SAFE WORKING CONDITIONS AT THE LABORATORY AND WORKPLACE, AND OBSERVE SAFETY PRECAUTIONS--The student will be able to:

01.01 Clean the work area and maintain it in a safe condition.
01.02 Apply lab policies and procedures for safety, including fire safety.
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 Demonstrate procedures for disaster situations.
01.06 Demonstrate the proper use and care of hand and power tools and equipment.
01.07 Demonstrate knowledge of CPR (cardiopulmonary resuscitation) and first aid.
01.08 Troubleshoot residential electric circuits.
01.09 Drill holes in metal, wood, and concrete for electrical wiring.
01.10 Identify and select tools, equipment, materials, and wires to complete a job.
01.11 Lay out electrical devices, complying with regulations.
01.12 Install the following, complying with the appropriate local, state, or national electric codes:
a. Conductors and cable
b. Standard outlets and switch boxes
c. Explain cord connections on major appliances
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.

02.0 DEMONSTRATE AN UNDERSTANDING OF BASIC DIRECT-CURRENT (DC) ELECTRICAL-CIRCUIT SKILLS--The student will be able to:

02.01 Define the terms "voltage," "current," "resistance," "power," and "energy."
02.02 Measure voltage, amperage, and resistance, using a volt-ohm meter (VOM) and a digital volt-ohm meter (DVM).
02.03 Analyze, and explain a series, series-parallel, and parallel circuit.
02.04 Draw each type of circuit and calculate the circuit values.
02.05 Explain and apply Ohm's Law.
02.06 Compute conductance and resistance of conductors and insulators.
02.07 Read and interpret color codes to identify resistors.
02.08 Explain voltage dividers (loaded and unloaded).

03.0 DEMONSTRATE APPROPRIATE COMMUNICATION SKILLS--The student will be able to:

03.01 Ask and answer questions coherently and concisely.
03.02 Read and follow written instructions and listen to and follow oral instructions.
03.03 Give reports orally and in writing.
03.04 Read critically in order to recognize assumptions and implications and to evaluate ideas.
03.05 Find job-related information in technical literature such as a manufacturer's manual.
03.06 Read and interpret the graphs, charts, diagrams and tables commonly used in this industry/occupation area.
03.07 Communicate job-related information with other trades.
03.08 Demonstrate appropriate telephone communication skills.
03.09 Identify the parts and functions of a computer system.
03.10 Identify the uses of the computer, including applications of the computer in the school, home and business.
03.11 Perform computer activities by preparing documents with the use of word-processing or database-applications software.

04.0 APPLY ELECTRICITY-RELATED BASIC MATH--The student will be able to:

04.01 Solve basic-math problems related to electrical work.
04.02 Convert units of measurement between the English system and the metric system.
04.03 Use scientific notation.
04.04 Demonstrate proficiency with a calculator.
04.05 Solve basic algebraic formulas related to electricity.
04.06 Solve basic trigonometric functions related to electrical theory.
04.07 Explain basic AC theory and solve related mathematical problems using appropriate test equipment.
04.08 Solve math-related problems from measurements on training aids. (Optional)
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04.08 Solve math-related problems from measurements on training aids. (Optional)

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.
05.05 Explain molecular action as a result of temperature extremes, chemical reaction, and moisture content.
05.06 Draw conclusions or make inferences from data.
05.07 Explain how voltage is produced by chemical, mechanical, thermal, photoelectric means, and piezo electric means.
05.08 Identify blueprint symbols.

06.0 DEMONSTRATE EMPLOYABILITY SKILLS--The student will be able to:

06.01 Conduct a job search and identify career-growth and advanced-training opportunities, including apprenticeship programs.
06.02 Secure information about a job.
06.03 Identify documents that may be required for a job application.
06.04 Complete a job-application form.
06.05 Demonstrate competence in job-interview techniques.

06.06 Demonstrate productive work habits and positive attitudes.
06.07 Demonstrate knowledge of how to make job changes appropriately.
06.08 Identify ethical practices and responsibilities.
06.09 Demonstrate acceptable personal and professional hygiene.
06.10 Apply the principles of time management, work simplification, and teamwork when performing assigned tasks.
06.11 Explain the importance of taking pride in the quality of work performed.
06.12 Describe the importance of a drug-free workplace and the industry's policies toward drug use.
06.13 Describe the ramifications of a poor-driving record on employability opportunities and maintain a good driver's record.
06.14 Describe "Florida's Right-to-Know" Law as recorded in Florida Statutes, Chapter 442.

07.0 READ AND INTERPRET BASIC ELECTRIC CODES--The student will be able to:

07.01 Describe the importance of following the local, state and national electric codes.
07.02 Read and interpret basic electric codes, wiring plans and specifications.
07.03 Identify licensure requirements for electrical occupations.

08.0 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP--The student will be able to:

08.01 Define "entrepreneurship."
08.02 Describe the importance of entrepreneurship to the American economy and the role of small business in the free-enterprise system.
08.03 List the advantages and disadvantages of business ownership.
08.04 Identify the risks involved in the ownership of a business.
08.05 Identify the personal characteristics of a successful entrepreneur.
08.06 Identify the business skills (including computer skills) needed to operate a small business efficiently and effectively.

09.0 DEMONSTRATE POSITIVE CUSTOMER-RELATIONS SKILLS--The student will be able to:

09.01 Exercise self-control.
09.02 Identify and demonstrate appropriate responses to criticism.
09.03 Recognize basic human-relations skills as they relate to success in the electrical industry.
09.04 Resolve customer complaints in a positive, professional manner.
09.05 Demonstrate respect for customer property by cleaning the work area after duties are completed.

OCCUPATIONAL COMPLETION POINT - DATA CODE - B
RESIDENTIAL ELECTRICIAN - Industry Title

10.0 DEMONSTRATE PROFICIENCY IN ELECTRICAL MATH 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 INSTALL RESIDENTIAL WIRING--The student will be able to:

12.01 Identify residential-wiring requirements and specifications in accordance with a wiring plan.
12.02 Draw a residential wiring plan, using electrical-wiring symbols.
12.03 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.
12.04 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.
12.05 Install and wire a low-voltage signal system.
12.06 Install conduit systems.
12.07 Provide power for heating, ventilation, and air-conditioning equipment.
12.08 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
12.09 Demonstrate knowledge of the requirements for the installation of a swimming-pool electrical system.
12.10 Connect single-phase and three-phase transformers.

OCCUPATIONAL COMPLETION POINT - DATA CODE - C
COMMERCIAL ELECTRICIAN - Industry Title

13.0 DEMONSTRATE PROFICIENCY IN COMMERCIAL WIRING--The student will be able to:

13.01 Read and interpret a commercial wiring plan and specifications.
13.02 Draw a commercial electrical-wiring plan.
13.03 Select tools, equipment, materials, and wires to complete a job.
13.04 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

13.05 Describe the difference between a residential and a commercial lighting circuit.
13.06 Construct control circuits from schematics.
13.07 Describe high-voltage (over 600V) wiring requirements.
13.08 Demonstrate knowledge of installing wiring in hazardous areas.
13.09 Explain a commercial three-phase receptacle circuit, and an emergency-lighting system.
13.10 Explain commercial-service-entrance requirements.

14.0 DEMONSTRATE SPECIALIZED ELECTRICAL SKILLS--The student will be able to:

14.01 Explain solid-state control devices.
14.02 Explain data cable installation according to the plan and specifications.
14.03 Discuss fiber-optics installation requirements.

OCCUPATIONAL COMPLETION POINT - DATA CODE - D
Industrial Electrician - Industry Title

15.0 DEMONSTRATE COMPETENCY IN INDUSTRIAL WIRING--The student will be able to:

15.01 Draw an industrial one-line power diagram.
15.02 Test insulation resistance using a megohm meter.
15.03 Install a motor branch circuit.
15.04 Using the National Electrical Code (NEC), make the following required calculations:
a. Conductor size
b. Overcurrent protection
c. Overload protection
d. Short circuit protection

15.05 Install a 277v lighting branch circuit.
15.06 Describe a bus duct power distribution system.
15.07 Describe fiber-optic installation requirements.
15.08 Demonstrate the use of industrial test equipment.
15.09 Install the following:
a. Disconnect switch - fused and unfused
b. Raceways
c. Emergency stop switch
d. Circuit breaker
e. Panelboard

16.0 DEMONSTRATE COMPETENCY IN TRANSFORMERS--The student will be able to:

16.01 Explain the basic principles of mutual induction and transformer action.
16.02 Explain the operation and use of a current transformer.
16.03 Explain the operation and use of a potential transformer.
16.04 Explain the operation and use of a buck-boost transformer and when it is used.
16.05 Explain and connect 3 phase transformers in both delta and wye configuration.
16.06 Calculate the over current protection requirements for the primary and secondary.
16.07 Explain what transformer impedance is and it’s importance.

17.0 DEMONSTRATE COMPETENCY IN AC AND DC MOTORS--The student will be able to:

17.01 Install and connect the following types of DC motors:
- a. Series
- b. Shunt
- c. Compound

17.02 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

17.03 Install and connect the following types of three phase AC motors:
- a. Squirrel-cage induction
- b. Wound-rotor
- c. Synchronous

17.04 Demonstrate the ability to select and connect a three-phase induction motor for either high or low voltage requirements.

18.0 DEMONSTRATE COMPETENCY IN ELECTRICAL AND ELECTRONIC CONTROL CIRCUITS AND EQUIPMENT--The student will be able to:

18.01 Draw an elementary motor control ladder diagram.

18.02 Interpret symbols, read and troubleshoot from schematics and ladder diagrams.

18.03 Describe the operation of the following overload relays:
- a. Thermal
- b. Magnetic
- c. Thermal-magnetic

18.04 Install a manual single phase and three phase control station.

18.05 Install a three-phase magnetic starter.

18.06 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

18.07 Install, operate, and troubleshoot the following relay control circuits:
- a. Start/stop
- b. Forward/reverse
- c. Hands-off-auto
- d. Start/jog
- e. Automatic timed sequence, "ON" and "OFF" delays
- f. Manually timed sequence, "ON" and "OFF" delays
- g. Plugging
- h. DC injection braking

18.08 Install, operate and troubleshoot the following electronic control equipment and circuits:
- a. Variable frequency drive (VFD)
- b. DC drive

18.09 Explain the alternatives to relay logic control.

July 2001

Florida Department of Education
INTENDED OUTCOMES

Program Title:	Industrial Electricity
	PSAV
Program Number	I460313
CIP Number	0646.030203
Grade Level	30, 31
Length	960 Hours
Certification	ELECTRICAL @7 G
Basic Skills	
Math	9
Language	9
Reading	9

INTENDED OUTCOMES: After successfully completing appropriate course(s) for each occupational completion point of this program, the student will be able to perform the following:

OCCUPATIONAL COMPLETION POINT - DATA - A (300 hours)
ELECTRICIAN HELPER - DOT CODE 829.684-022

01.0 Identify safe working conditions at the laboratory and workplace, and observe safety precautions.
02.0 Demonstrate an understanding of basic direct-current (DC) electrical-circuit skills.
03.0 Demonstrate appropriate communication skills.
04.0 Apply electricity-related basic math.
05.0 Demonstrate an understanding of basic electricity.
06.0 Demonstrate employability skills.
07.0 Read and interpret basic electric codes.
08.0 Demonstrate an understanding of entrepreneurship.
09.0 Demonstrate positive customer-relations skills.

OCCUPATIONAL COMPLETION POINT - DATA CODE - B (300 hours)
INDUSTRIAL ELECTRICIAN - 824.261-010

10.0 Demonstrate competency in industrial wiring.
11.0 Demonstrate competency in transformers.
12.0 Demonstrate competency in AC and DC motors.
13.0 Demonstrate competency in electrical and electronic control circuits and equipment.

OCCUPATIONAL COMPLETION POINT - DATA CODE - C (360 hours)
ELECTRICAL TECHNICIAN - 003.161-010

14.0 Demonstrate competency in electronic circuits and devices.
15.0 Demonstrate competency in programmable logic controllers (PLCs).

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Program Title: Industrial Electricity
Postsecondary Number: I460313

OCCUPATIONAL COMPLETION POINT - DATA CODE - A
ELECTRICIAN HELPER - DOT CODE 829.684-022

01.0 IDENTIFY SAFE WORKING CONDITIONS AT THE LABORATORY AND WORKPLACE, AND OBSERVE SAFETY PRECAUTIONS--The student will be able to:

01.01 Clean the work area and maintain it in a safe condition.
01.02 Apply lab policies and procedures for safety, including fire safety.
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 Demonstrate procedures for disaster situations.
01.06 Demonstrate the proper use and care of hand and power tools and equipment.
01.07 Demonstrate knowledge of CPR (cardiopulmonary resuscitation) and first aid.
01.08 Troubleshoot residential electric circuits.
01.09 Drill holes in metal, wood, and concrete for electrical wiring.
01.10 Identify and select tools, equipment, materials, and wires to complete a job.
01.11 Lay out electrical devices, complying with regulations.
01.12 Install the following, complying with the appropriate local, state, or national electric codes:
a. Conductors and cable
b. Standard outlets and switch boxes
c. Explain cord connections on major appliances
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.

02.0 DEMONSTRATE AN UNDERSTANDING OF BASIC DIRECT-CURRENT (DC) ELECTRICAL-CIRCUIT SKILLS--The student will be able to:

02.01 Define the terms "voltage," "current," "resistance," "power," and "energy."
02.02 Measure voltage, amperage, and resistance, using a volt-ohm meter (VOM) and a digital volt-ohm meter (DVM).
02.03 Analyze, and explain a series, series-parallel, and parallel circuit.
02.04 Draw each type of circuit and calculate the circuit values.
02.05 Explain and apply Ohm's Law.
02.06 Compute conductance and resistance of conductors and insulators.
02.07 Read and interpret color codes to identify resistors.
02.08 Explain voltage dividers (loaded and unloaded).

03.0 DEMONSTRATE APPROPRIATE COMMUNICATION SKILLS--The student will be able to:

03.01 Ask and answer questions coherently and concisely.
03.02 Read and follow written instructions and listen to and follow oral instructions.
03.03 Give reports orally and in writing.
03.04 Read critically in order to recognize assumptions and implications and to evaluate ideas.
03.05 Find job-related information in technical literature such as a manufacturer's manual.
03.06 Read and interpret the graphs, charts, diagrams and tables commonly used in this industry/occupation area.
03.07 Communicate job-related information with other trades.
03.08 Demonstrate appropriate telephone communication skills.
03.09 Identify the parts and functions of a computer system.
03.10 Identify the uses of the computer, including applications of the computer in the school, home and business.
03.11 Perform computer activities by preparing documents with the use of word-processing or database-applications software.

04.0 APPLY ELECTRICITY-RELATED BASIC MATH--The student will be able to:

04.01 Solve basic-math problems related to electrical work.
04.02 Convert units of measurement between the English system and the metric system.
04.03 Use scientific notation.
04.04 Demonstrate proficiency with a calculator.
04.05 Solve basic algebraic formulas related to electricity.
04.06 Solve basic trigonometric functions related to electrical theory.
04.07 Explain basic AC theory and solve related mathematical problems using appropriate test equipment.
04.08 Solve math-related problems from measurements on training aids. (Optional)

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.
05.05 Explain molecular action as a result of temperature extremes, chemical reaction, and moisture content.
05.06 Draw conclusions or make inferences from data.
05.07 Explain how voltage is produced by chemical, mechanical, thermal, photoelectric, and piezo electric means.
05.08 Identify blueprint symbols.

06.0 DEMONSTRATE EMPLOYABILITY SKILLS--The student will be able to:

06.01 Conduct a job search and identify career-growth and advanced-training opportunities, including apprenticeship programs.
06.02 Secure information about a job.
06.03 Identify documents that may be required for a job application.
06.04 Complete a job-application form.
06.05 Demonstrate competence in job-interview techniques.
06.06 Demonstrate productive work habits and positive attitudes.
06.07 Demonstrate knowledge of how to make job changes appropriately.
06.08 Identify ethical practices and responsibilities.

06.09 Demonstrate acceptable personal and professional hygiene.
06.10 Apply the principles of time management, work simplification, and teamwork when performing assigned tasks.
06.11 Explain the importance of taking pride in the quality of work performed.
06.12 Describe the importance of a drug-free workplace and the industry's policies toward drug use.
06.13 Describe the ramifications of a poor-driving record on employability opportunities and maintain a good driver's record.
06.14 Describe "Florida's Right-to-Know" Law as recorded in Florida Statutes, Chapter 442.

07.0 READ AND INTERPRET BASIC ELECTRIC CODES--The student will be able to:

07.01 Describe the importance of following the local, state and national electric codes.
07.02 Read and interpret basic electric codes, wiring plans and specifications.
07.03 Identify licensure requirements for electrical occupations.

08.0 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP--The student will be able to:

08.01 Define "entrepreneurship."
08.02 Describe the importance of entrepreneurship to the American economy and the role of small business in the free-enterprise system.
08.03 List the advantages and disadvantages of business ownership.
08.04 Identify the risks involved in the ownership of a business.
08.05 Identify the personal characteristics of a successful entrepreneur.
08.06 Identify the business skills (including computer skills) needed to operate a small business efficiently and effectively.

09.0 DEMONSTRATE POSITIVE CUSTOMER-RELATIONS SKILLS--The student will be able to:

09.01 Exercise self-control.
09.02 Identify and demonstrate appropriate responses to criticism.
09.03 Recognize basic human-relations skills as they relate to success in the electrical industry.
09.04 Resolve customer complaints in a positive, professional manner.
09.05 Demonstrate respect for customer property by cleaning the work area after duties are completed.

OCCUPATIONAL COMPLETION POINT - DATA CODE - B
Industrial Electrician - 824.261-010

10.0 DEMONSTRATE COMPETENCY IN INDUSTRIAL WIRING--The student will be able to:

10.01 Draw an industrial one-line power diagram.
10.02 Test insulation resistance using a megohm meter.
10.03 Install a motor branch circuit.
10.04 Using the National Electrical Code (NEC), make the following required calculations:
a. Conductor size

b. Overcurrent protection
c. Overload protection
d. Short circuit protection

10.05 Install a 277v lighting branch circuit.
10.06 Describe a bus duct power distribution system.
10.07 Describe fiber-optic installation requirements.
10.08 Demonstrate the use of industrial test equipment.
10.09 Install the following:
a. Disconnect switch - fused and unfused
b. Raceways
c. Emergency stop switch
d. Circuit breaker
e. Panelboard

11.0 DEMONSTRATE COMPETENCY IN TRANSFORMERS--The student will be able to:

11.01 Explain the basic principles of mutual induction and transformer action.
11.02 Explain the operation and use of a current transformer.
11.03 Explain the operation and use of a potential transformer.
11.04 Explain the operation and use of a buck-boost transformer and when it is used.
11.05 Explain and connect 3 phase transformers in both delta and wye configuration.
11.06 Calculate the over current protection requirements for the primary and secondary.
11.07 Explain what transformer impedance is and it's importance.

12.0 DEMONSTRATE COMPETENCY IN AC AND DC MOTORS--The student will be able to:

12.01 Install and connect the following types of DC motors:
a. Series
b. Shunt
c. Compound
12.02 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
12.03 Install and connect the following types of three phase AC motors:
a. Squirrel-cage induction
b. Wound-rotor
c. Synchronous
12.04 Demonstrate the ability to select and connect a three-phase induction motor for either high or low voltage requirements.

13.0 DEMONSTRATE COMPETENCY IN ELECTRICAL AND ELECTRONIC CONTROL CIRCUITS AND EQUIPMENT--The student will be able to:

13.01 Draw an elementary motor control ladder diagram.
13.02 Interpret symbols, read and troubleshoot from schematics and ladder diagrams.
13.03 Describe the operation of the following overload relays:
a. Thermal
b. Magnetic
c. Thermal-magnetic

13.04 Install a manual single phase and three phase control station.
13.05 Install a three-phase magnetic starter.
13.06 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
13.07 Install, operate, and troubleshoot the following relay control circuits:
a. Start/stop
b. Forward/reverse
c. Hands-off-auto
d. Start/jog
e. Automatic timed sequence, "ON" and "OFF" delays
f. Manually timed sequence, "ON" and "OFF" delays
g. Plugging
h. DC injection braking
13.08 Install, operate and troubleshoot the following electronic control equipment and circuits:
a. Variable frequency drive (VFD)
b. DC drive
13.09 Explain the alternatives to relay logic control.

OCCUPATIONAL COMPLETION POINT - DATA CODE - C
ELECTRICAL TECHNICIAN - 003.161.010

14.0 DEMONSTRATE COMPETENCY IN ELECTRONIC CIRCUITS AND DEVICES--The student will be able to:

14.01 Explain the principles of operation of the following devices.
a. Rectifiers and diodes
b. Transistors, PNP and NPN
c. Operational amplifiers
d. Logic gates
e. 555 timers
f. DC power supplies
g. Inductive, capacitive, and magnetic proximity switches
h. Photoelectric-eyes
i. Infrared scanners (bar-code)
j. Ultra-sonic sensors
14.02 Demonstrate competency in using the following test equipment:
a. Oscilloscope
b. True RMS voltmeter
c. Signal generator
d. LCR meter
e. Logic probe
f. Function generator
g. Frequency counter
14.03 Conduct, test and troubleshoot the following:
a. Half and full-wave DC power supplies
b. A filtered full-wave regulated DC power supply
c. And, or, not, nand, exclusive or, and exclusive nor logic circuits

d. Operational amplifier circuit
e. Timing circuit using a 555 timer
f. Common base, common collector, and common emitter transistor circuits for both NPN and PNP transistors

14.04 Describe and write a simple Boolean equation.

19.05 Explain and demonstrate proper shielding and grouping methods.

15.0 DEMONSTRATE COMPETENCY IN PROGRAMMABLE LOGIC CONTROLLERS (PLCS)-- The student will be able to:

15.01 Name the basic components of a PLC.

15.02 Explain the operation of the following:
a. Input modules
b. Output modules
c. Power supply
d. Central processing unit (CPU)
e. Programming device

15.03 Explain typical memory structure and the terms, ROM, RAM, EEPROM, Bit, Byte, Word, and Double-word.

15.04 Explain the following numbering systems and demonstrate ability to convert from one to another.
a. Decimal
b. Binary
C. Octal
d. Hexadecimal

15.05 Explain how digital logic gate devices are used in programming.

15.06 Connect, test, and operate the following input devices to the PLC:
a. Pushbuttons (NC and NO)
b. Proximity switches (capacitive and inductive)
c. Photo-eyes (NC and NO)
d. On/off switches
e. Analog (4-20 ma and 0-10v) devices

15.07 Connect, test, and operate the following output devices:
a. Indicator lights
b. Magnetic motor contractors
c. Solenoid operated valves

15.08 Demonstrate the ability to access the PLC software and monitor an operating program.

15.09 Write, debug, download, and run the following application programs:
a. Basic start/stop operation
b. Forward/reverse operation
c. Timed sequence operation
d. Counting operation
e. Shift register operation
f. Word transfer operation
g. Analog input/output operation
h. Jump instruction operation
I. Set-reset operation
j. Compare values operation
k. Compute values operation

15.10 Demonstrate the ability to address inputs and outputs in programming language.

15.11 Demonstrate the ability to edit and existing operational program, document changes, and save changes to a file.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

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

COURSE DESCRIPTION:

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

01.0 IDENTIFY SAFE WORKING CONDITIONS AT THE LABORATORY AND WORKPLACE, AND OBSERVE SAFETY PRECAUTIONS--The student will be able to:

01.01 Clean the work area and maintain it in a safe condition. (AT.8.1.4.3), (HE.B.1.4.2),
01.02 Apply lab policies and procedures for safety, including fire safety. (AT.8.1.4.3), (HE.B.1.4.4)
01.03 Identify and operate workplace-safety electrical devices. (AT.8.1.4.3), (HE.B.1.4.4), (LA.A.2.4.4), (LA.A.2.4.6), (LA.B.2.4.3)
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. (AT.8.1.4.2), (HE.A.2.4.2), (SC.G.2.4.6)
01.05 Demonstrate procedures for disaster situations. (AT.8.1.4.1), (HE.B.1.4.6)
01.06 Demonstrate the proper use and care of hand and power tools and equipment. (AT.4.1.4.4), (AT.8.1.4.3), (HE.B.1.4.4)
01.07 Demonstrate knowledge of CPR (cardiopulmonary resuscitation) and first aid. (HE.B.1.4.5)

02.0 DEMONSTRATE AN UNDERSTANDING OF BASIC DIRECT-CURRENT (DC) ELECTRICAL-CIRCUIT SKILLS--The student will be able to:

02.01 Define the terms "voltage," "current," "resistance," "power," and "energy." (SC.B.1.4.4), (SC.B.1.4.7), (LA.A.1.4.2), (LA.A.1.4.3), (LA.B.2.4.1)
02.02 Measure voltage, amperage, and resistance, using a volt-ohm meter (VOM) and a digital volt-ohm meter (DVM). (MA.B.4.4.1), (SC.B.1.4.4), (SC.B.1.4.7)
02.03 Analyze, and explain a series, series-parallel, and parallel circuit. (MA.D.2.4.2), (SC.B.1.4.4), (SC.B.1.4.7), (LA.C.3.4.2), (LA.B.2.4.1)
02.04 Draw each type of circuit and calculate the circuit values. (MA.B.1.4.1), (SC.B.1.4.4), (SC.B.1.4.7)
02.05 Explain and apply Ohm's Law. (MA.D.2.4.2), (SC.B.1.4.4), (SC.B.1.4.7), (LA.C.3.4.2), (LA.C.3.4.3), (LA.B.2.4.4)

03.0 DEMONSTRATE APPROPRIATE COMMUNICATION SKILLS--The student will be able to:

03.01 Ask and answer questions coherently and concisely. (LA.A.1.4.1), (LA.A.2.4.6), (LA.C.3.4.1)
03.02 Read and follow written instructions and listen to and follow oral instructions. (LA.A.2.4.7), (LA.A.2.4.8), (LA.C.1.4.1), (LA.A.1.4.2), (LA.A.1.4.3), (LA.A.2.4.1), (LA.A.2.4.4)
03.03 Give reports orally and in writing. (LA.C.3.4.4), (LA.B.2.4.2), (LA.B.2.4.3), (LA.B.2.4.4)
03.04 Read critically in order to recognize assumptions and implications and to evaluate ideas. (LA.A.2.4.1), (LA.A.2.4.2), (LA.A.2.4.4), (LA.C.2.4.5)
03.05 Find job-related information in technical literature such as a manufacturer's manual. (AT.4.1.4.2), (LA.A.2.4.4), (LA.B.2.4.4)
03.06 Read and interpret the graphs, charts, diagrams and tables. (MA.E.1.4.1), (MA.B.1.4.3), (LA.A.1.4.2)

04.0 APPLY ELECTRICITY-RELATED BASIC MATH--The student will be able to:

04.01 Solve basic-math problems related to electrical work. (MA.A.3.4.3)
04.02 Convert units of measurement between the English system and the metric system. (MA.B.4.4.1)
04.03 Use scientific notation. (MA.A.1.4.4)
04.04 Demonstrate proficiency with a calculator. (MA.A.3.4.3)

05.0 DEMONSTRATE AN UNDERSTANDING OF BASIC ELECTRICITY--The student will be able to:

05.01 Explain the principles of electromagnetism. (SC.C.2.4.3), (SC.C.2.4.2), (SC.B.1.4.4), (LA.C.3.4.2), (LA.C.3.4.3), (LA.B.2.4.2)
05.02 Explain the magnetic properties of circuits and devices. (SC.C.2.4.3), (SC.C.2.4.2), (SC.B.1.4.4), (LA.C.3.4.2), (LA.C.3.4.3), (LA.B.2.4.3)
05.03 Relate electricity to the nature of matter. (SC.C.2.4.5), (SC.A.1.4.1), (LA.B.2.4.4)
05.04 Describe various ways that electricity is produced. (SC.B.1.4.5), (LA.C.3.4.2), (LA.C.3.4.3)

06.0 DEMONSTRATE EMPLOYABILITY SKILLS--The student will be able to:

06.01 Conduct a job search and identify career-growth and advanced-training opportunities, including apprenticeship programs. (AT.1.1.4.1), (LA.A.2.4.4), (LA.A.2.4.6), (LA.A.2.4.8), (LA.B.1.4.3)
06.02 Secure information about a job. (AT.3.1.1.1), (LA.B.2.4.2)
06.03 Identify documents that may be required for a job application. (AT.1.1.4.1), (LA.A.2.4.4), (LA.B.2.4.2)
06.04 Complete a job-application form. (LA.B.2.4.1)
06.05 Demonstrate competence in job-interview techniques. (LA.C.3.4.4)
06.06 Demonstrate productive work habits and positive attitudes. (AT.9.1.4.1), HE.B.1.4.1)
06.07 Demonstrate knowledge of how to make job changes appropriately. (AT.9.1.4.2)

07.0 READ AND INTERPRET BASIC ELECTRIC CODES--The student will be able to:

07.01 Describe the importance of following the local, state and national electric codes. (AT.8.1.4.3), (LA.C.3.4.2)
07.02 Read and interpret basic electric codes, wiring plans and specifications. (LA.A.2.4.4), (LA.A.2.4.6), (LA.A.2.4.8)

08.0 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP--The student will be able to:

08.01 Define "entrepreneurship." (AT.2.3.4.1), (SS.D.2.4.4), (LA.C.3.4.2)
08.02 Describe the importance of entrepreneurship to the American economy and the role of small business in the free-enterprise system. (LA.C.3.4.2)
08.03 List the advantages and disadvantages of business ownership. (AT.2.3.4.2), (LA.B.2.4.2)

09.0 DEMONSTRATE POSITIVE CUSTOMER-RELATIONS SKILLS--The student will be able to:

09.01 Exercise self-control. (AT.9.1.4.2), HE.B.3.4.5)
09.02 Identify and demonstrate appropriate responses to criticism. (AT.9.1.4.2), HE.B.3.4.5), (LA.C.1.4.4)
09.03 Recognize basic human-relations skills as they relate to success in the electrical industry. (AT.9.1.4.1), (HE.B.3.4.5), (LA.D.1.4.2)
09.04 Resolve customer complaints in a positive, professional manner. (AT.9.1.4.1), HE.B.3.4.4), (LA.D.1.4.2)
09.05 Demonstrate respect for customer property by cleaning the work area after duties are completed. (AT.8.1.4.3), HE.B.3.4.2)

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

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

COURSE DESCRIPTION:

This course enables students to develop competencies related to safety practices, the direct-current electrical circuit, communication, math applications, electric codes, and employability skills.

01.0 IDENTIFY SAFE WORKING CONDITIONS AT THE LABORATORY AND WORKPLACE, AND OBSERVE SAFETY PRECAUTIONS--The student will be able to:

01.08 Troubleshoot residential electric circuits. (MA.B.4.4.1)
01.09 Drill holes in metal, wood, and concrete for electrical wiring. (AT.4.1.4.4)
01.10 Identify and select tools, equipment, materials, and wires to complete a job. (AT.1.1.4.1)
01.11 Lay out electrical devices, complying with regulations. (AT.8.1.4.3)
01.12 Install the following, complying with the appropriate local, state, or national electric codes: (AT.8.1.4.3)
a. Conductors and cable
b. Standard outlets and switch boxes
c. Explain cord connections on major appliances
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.

02.0 DEMONSTRATE AN UNDERSTANDING OF BASIC DIRECT-CURRENT (DC) ELECTRICAL-CIRCUIT SKILLS--The student will be able to:

02.06 Compute conductance and resistance of conductors and insulators. (MA.D.2.4.2), (SC.B.1.4.4), (SC.B.1.4.7)
02.07 Read and interpret color codes to identify resistors. (MA.D.2.4.2), (LA.A.2.4.4), (LA.A.2.4.6), (LA.A.2.4.8), (LA.B.1.4.2)
02.08 Explain voltage dividers (loaded and unloaded). (MA.D.2.4.2)(LA.C.3.4.2)

03.0 DEMONSTRATE APPROPRIATE COMMUNICATION SKILLS--The student will be able to:

03.07 Communicate job-related information with other trades. (AT.4.1.4.1)
03.08 Demonstrate appropriate telephone communication skills. (AT.4.1.4.4)
03.09 Identify the parts and functions of a computer system. (AT.5.2.4.3)
03.10 Identify the uses of the computer, including applications of the computer in the school, home and business. (AT.5.1.4.1)
03.11 Perform computer activities by preparing documents with the use of word-processing or database-applications software. (AT.5.1.4.2)

04.0 APPLY ELECTRICITY-RELATED BASIC MATH--The student will be able to:

04.05 Solve basic algebraic formulas related to electricity. (MA.D.2.4.2)
04.06 Solve basic trigonometric functions related to electrical theory. (MA.C.3.4.1)
04.07 Explain basic AC theory and solve related mathematical problems using appropriate test equipment.
04.08 Solve math-related problems from measurements on training aids. (Optional)

05.0 DEMONSTRATE AN UNDERSTANDING OF BASIC ELECTRICITY--The student will be able to:

05.05 Explain molecular action as a result of temperature extremes, chemical reaction, and moisture content. (SC.F.1.4.3), (SC.A.1.4.4), (SC.F.1.4.6)
05.06 Draw conclusions or make inferences from data. (MA.E.1.4.1), (LA.A.2.4.4), (LA.A.2.4.6), (LA.A.2.4.8), (LA.C.3.4.2)
05.07 Explain how voltage is produced by chemical, mechanical, thermal, photoelectric, and piezo electric means. (SC.F.1.4.3), (SC.A.1.4.4), (SC.F.1.4.6), LA.C.3.4.2)
05.08 Identify blueprint symbols. (AT.9.1.4.1), (HE.B.3.4.4), (AT.4.1.4.4), (LA.A.2.4.4), (LA.A.2.4.6), (LA.A.2.4.7)

06.0 DEMONSTRATE EMPLOYABILITY SKILLS--The student will be able to:

06.08 Identify ethical practices and responsibilities. (AT.9.1.4.2), (HE.B.3.4.4), (LA.B.1.4.3)
06.09 Demonstrate acceptable personal and professional hygiene. (AT.2.1.4.2), (HE.A.1.4.1),
06.10 Apply the principles of time management, work simplification, and teamwork when performing assigned tasks. (AT.2.1.4.2), (HE.B.3.4.2)
06.11 Explain the importance of taking pride in the quality of work performed. (AT.9.1.4.1)
06.12 Describe the importance of a drug-free workplace and the industry's policies toward drug use. (AT.9.1.4.1), (HE.A.1.4.2)
06.13 Describe the ramifications of a poor-driving record on employability opportunities and maintain a good driver's record. (AT.9.1.4.1), (HE.B.1.4.1)
06.14 Describe "Florida's Right-to-Know" Law as recorded in Florida Statutes, Chapter 442. (AT.8.1.4.3)

07.0 READ AND INTERPRET BASIC ELECTRIC CODES--The student will be able to:

07.03 Identify licensure requirements for electrical occupations. (AT.4.1.4.2), (LA.A.2.4.4), (LA.A.2.4.6)

08.0 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP--The student will be able to:

08.04 Identify the risks involved in the ownership of a business (AT.2.3.4.1), (SS.D.2.4.2), (SS.D.1.4.1)
08.05 Identify the personal characteristics of a successful entrepreneur. (AT.2.3.4.2), (SS.D.1.4.2)

08.06 Identify the business skills (including computer skills) needed to operate a small business efficiently and effectively. (AT.2.3.4.2)

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

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

COURSE DESCRIPTION:

This course provides students with math, alternating-current circuit, skills.

10.0 DEMONSTRATE PROFICIENCY IN ELECTRICAL MATH SKILLS--The student will be able to:

10.01 Calculate wiring costs. (MA.A.3.4.3)
10.02 Draw an industrial electrical-wiring plan. (AT.4.1.4.4), (MA.B.1.4.1)
10.03 Describe the use of high-voltage test equipment. (MA.B.4.4.1), (LA.C.3.4.2), (LA.B.2.4.2)
10.04 Describe how to test insulation. (MA.B.4.4.1), (LA.C.3.4.2)
10.05 Describe how to balance a load. (MA.B.4.1.4), (LA.C.3.4.2), (LA.B.2.4.2)
10.06 Use electrical related math skills. (MA.A.3.4.3)

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Course Number: 8727240
Course Title: Electricity 4
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.

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. (MA.D.1.4.2), (SC.A.1.4.2), (SC.A.1.4.4), (SC.A.1.4.1)
- 11.02 Demonstrate proficiency in measuring, testing and connecting a transformer. (MA.B.4.4.1)
- 11.03 Apply the principles of transformers to AC circuits. (SC.A.1.4.2), (SC.A.1.4.4), (SC.A.1.4.1)
- 11.04 Identify the properties of an AC signal. (MA.B.4.4.1)
- 11.05 Identify AC sources. ((AT.5.1.4.2)
- 11.06 Analyze and apply the principles of transformers to AC circuits. (AT.5.1.4.2), (SC.A.1.4.2), (SC.A.1.4.4), (SC.A.1.4.1)
- 11.07 Analyze polyphase circuits. (AT.5.1.4.2)
- 11.08 Install a simple polyphase circuit. (AT.1.1.4.1)

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

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

COURSE DESCRIPTION:

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

12.0 INSTALL RESIDENTIAL WIRING--The student will be able to:

12.01 Identify residential-wiring requirements and specifications in accordance with a wiring plan. (AT.4.1.4.4), (LA.A.2.4.4), (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
12.02 Draw a residential wiring plan, using electrical-wiring symbols. (AT.4.1.4.4)
12.03 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. (AT.4.1.4.4)
12.04 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. (AT.4.1.4.4)

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

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

COURSE DESCRIPTION:

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

12.0 INSTALL RESIDENTIAL WIRING--The student will be able to:

12.05 Install and wire a low-voltage signal system. (AT.4.1.4.4)
12.06 Install conduit systems. (AT.4.1.4.4)
12.07 Provide power for heating, ventilation, and air-conditioning equipment. (AT.4.1.4.4)
12.08 Install the following, complying with the appropriate local, state, or national electric codes: (AT.4.1.4.4)
a. Service-entrance main panel
b. Service-entrance meter base
c. Alarm system/smoke detectors
12.09 Demonstrate knowledge of the requirements for the installation of a swimming-pool electrical system. (AT.4.1.4.4)
12.10 Connect single-phase and three-phase transformers. (AT.4.1.4.4)

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

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

COURSE DESCRIPTION:

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

13.0 DEMONSTRATE PROFICIENCY IN COMMERCIAL WIRING--The student will be able to:

13.01 Read and interpret a commercial wiring plan and specifications. (AT.4.1.4.4), (LA.A.2.4.4), (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
13.02 Draw a commercial electrical-wiring plan. (AT.4.1.4.4)
13.03 Select tools, equipment, materials, and wires to complete a job. (AT.1.1.4.1)
13.04 Install the following according to the plan and specifications, complying with appropriate electric codes: (AT.8.1.4.3)
a. Wire mold
b. Conduit, duct, and raceway systems
c. Conductors in a conduit
13.05 Describe the difference between a residential and a commercial lighting circuit. (AT.4.1.4.4)(LA.C.3.4.2)
13.06 Construct control circuits from schematics. (AT.4.1.4.4), (LA.C.3.4.2)
13.07 Describe high-voltage (over 600V) wiring requirements. (AT.8.1.4.3), (LA.A.3.4.2)
13.08 Demonstrate knowledge of installing wiring in hazardous areas. (AT.8.1.4.3), (LA.C.3.4.2)
13.09 Explain a commercial three-phase receptacle circuit, and an emergency-lighting system. (AT.4.1.4.4), (LA.C.2.4.3)
13.10 Explain commercial-service-entrance requirements. (AT.4.1.4.4), (LA.C.2.4.3)

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

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

COURSE DESCRIPTION:

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

14.0 DEMONSTRATE SPECIALIZED ELECTRICAL SKILLS--The student will be able to:

14.01 Explain solid-state control devices. (AT.4.1.4.4), (LA.C.3.4.2)
14.02 Explain data cable installation according to the plan and specifications. (AT.4.1.4.4), (LA.A.2.4.4), (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.C.3.4.2)
14.03 Discuss fiber-optics installation requirements. (AT.4.1.4.4), (AC.A.2.4.6), (LA.C.3.4.2)