STRANDS AND STANDARDS

ELECTRICIAN 1

Course Description

The Electrician 1 course provides a solid foundation in electrical fundamentals and basic electrical theory. It covers math applications relevant to the electrical field and applies code requirements using the National Electrical Code (NEC). Students also gain practical experience in conduit bending and learn about electrical and job site hazards along with workplace safety.

Intended Grade Level	10-12
Units of Credit	0.5
Core Code	40.08.00.00.050
Concurrent Enrollment Core Code	40.08.00.13.050
Prerequisite	N/A
Skill Certification Test Number	Industry Test 952
Test Weight	1.0
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Electrical
Endorsement 2	N/A
Endorsement 3	N/A

STRAND 1: SAFETY

Students will practice electrical safety.

Standard 1

Demonstrate safe working procedures in a construction environment.

- Introduction to NFPA 70E

Standard 2

Explain the purpose of OSHA and how it promotes safety on the job.

Performance Skills

- Pass relevant safety tests with 100 percent.
- Use concepts and practices to solve, mitigate, and manage potential electrical hazards.
  - Personal protective equipment.
  - Lockout/tagout procedures.

STRAND 2: NATIONAL ELECTRICAL CODE (NEC).

Students will investigate the National Electrical Code.

Standard 1

Explore the NEC.

- Purpose
- Layout
- Navigation
- NEMA/NFPA
- Testing Laboratories
- Article 90: Introduction to NEC

Standard 2

Explore chapter 1 of the NEC.

- Article 100: Definitions
  - Nuance of language used (i.e. “shall” vs. “may,” “outlet” vs. “receptacle,” etc.)
- Article 110: Requirements for Electrical Installations

Standard 3

Explore chapter 2 of the NEC.

- Article 200: Proper use and Identification of Grounded Conductors
- Article 210: Branch Circuits
- Article 220: Load Calculations
- Article 225: Installation Requirements for Outside Branch Circuits & Feeders
- Article 230: Services
- Article 240: Overcurrent Protection
- Article 250: Grounding & Bonding

Performance Skills

- Reference the NEC as it applies to electrical installations.
- Complete a hands-on lab utilizing articles of NEC detailed in standard 3.

STRAND 3: ELECTRICAL THEORY

Students will apply electrical theory to electrical installations.

Standard 1

Recognize what atoms are and how they are constructed.

- Insulators
- Conductors
- Semiconductors

Standard 2

Explain Electron Theory as it applies to the movement of electrons.

Standard 3

Explain the importance of magnetism.

- Loadstones
- Permanent magnets

Standard 4

Explain electromagnetism.

- AC power generation
- Motors
- Transformers

Standard 5

Compare power generation and distribution systems and their functions.

- DC vs. AC
- Circuit Conditions (i.e. open, closed, fault, voltage drop)

Standard 6

Demonstrate knowledge of electrical series circuits using principles of electricity (Ohm's Law).

- Electromotive Force (Voltage)
- Intensity (Amperage)
- Resistance (Ohms)
- Power (Watts)

Standard 7

Apply mathematical principles to electrical systems.

- Ohm's Law
- Trig functions
- Equation manipulation

Performance Skills

- Using the power formula, calculate the amount of power used by a circuit.
- Using the formula of Ohm's Law, calculate an unknown value.

STRAND 4: ELECTRICAL TEST EQUIPMENT

Students will demonstrate the use of electrical testing equipment.

Standard 1

Compare electrical testing equipment and their operations.

- Ammeter
- Voltmeter
- Ohmmeter
- Continuity Tester
- Non-Contact Voltage Tester
- Megohmmeter

Standard 2

Explain the importance of proper meter polarity.

Standard 3

Explain the difference between digital and analog meters.

Performance Skills

- Demonstrate the use of different types of meters used to measure voltage, current, and resistance.

STRAND 5: PLANS & SCHEMATICS

Students will interpret electrical plans or schematics to construct electrical circuits.

Standard 1

Differentiate electrical symbols and their meanings.

Standard 2

Locate and identify the correct architectural scale on electrical prints.

Standard 3

Match information located on electrical schedules to electrical plans/schematics.

- Panel (circuiting, breaker size, conductor size)
- Fixture
- Conduit

Performance Skills

- Read and interpret a wiring diagram/electrical plan.
- Install a successful, simple circuit that would apply to residential construction.

STRAND 6: CONDUIT BENDING – HAND BENDING

Students will implement formulas and demonstrate bending techniques.

Standard 1

Compare the methods of hand bending conduit.

- Box offset
- Stub 90
- 3-point saddle
- 4-point saddle
- Offset

Standard 2

Use math formulas to determine conduit bends.

Performance Skills

- Make conduit bends (90 degree bends, back-to-back bends, offsets, kicks, saddle bends, etc.) using a hand bender.

STRAND 7: CTSOs & WORKPLACE SKILLS

Students will be encouraged to participate in a relevant CTSO (Career & Technical Student Organization) through the demonstration of electrician workplace and career readiness skills. These standards will not appear on state skill certification exams, but should be taught throughout the duration of the course.

Standard 1

Students will display personal skills related to the essential values, personality traits, and personal characteristics for success in the electrician profession and life.

- **Integrity** - demonstrate honesty and personal responsibility for actions.
- **Work ethic** - demonstrate tenacity, hard work, excellence, punctuality, meet deadlines; and be self-directed when completing tasks in the electrician professional setting.
- **Professionalism** - demonstrate maturity, self-confidence; and a positive image when working with teammates or clients on electrical installations..
- **Responsibility** - demonstrate dependability, consistency, and personal well-being when safely completing electrical tasks.
- **Adaptability/Flexibility** - Foster creativity, new ideas, and resilience when working to solve problems in electrical installations.
- **Self-motivated** - demonstrate a willingness to learn, independence, initiative, and a positive attitude when approaching new information

Standard 2

Students will display workplace skills related to the essential attitudes and abilities for success in the electrician profession.

- **Communication** – Demonstrates skills in listening and speaking; communicates professionally with teammates, supervisors, and customers in relation to electrical installations..
- **Decision making** – Analyzes key facts, data, and situations to employ reasoning skills for completing installation tasks.
- **Teamwork** – Builds trusting relationships, works cooperatively with others and utilizes individual strengths of team members when completing installation tasks.
- **Planning, organizing, and management** – Designs, prepares, and implements creative tasks within a desired timeframe; Sets priorities and responds to changing priorities.
- **Leadership** – Builds positive relationships and mitigates conflict.

Standard 3

Students will display technical skills that are grounded in design that deliver essential knowledge and competencies for success in the industry.

- **Computer and technology literacy**
- **Job specific skills**
- **Safety and health**
- **Service orientation** – responds to internal and external customers; demonstrates focus and presence; attends to personal matters away from the classroom.
- **Professional development** – demonstrates openness to learn, grow, and change in the construction industry.

Skill Certification Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		