

# Electrical Interim Credentials

#### DESCRIPTION

*Electrical Interim Credentials* is a self-paced, web-based pre-apprenticeship course intended for individuals in high school and beyond who are interested in a career path in the electrical trade. This course was created:

To help you decide if an apprenticeship in the electrical industry is the right career path for you <u>and</u> provide a direct path to acceptance into an **electrical training ALLIANCE** affiliated apprenticeship program upon successful completion.

#### **EXPECTATIONS AND GOALS**

Each e-learning lesson is completed in order on the Learning Management System (LMS). You can only advance to the next lesson if you have passed the one before it. Within each lesson, you will view videos and engage in scenario-based exercises and quizzes to assess your knowledge and understanding of the content.

It is important to do your best on all exercises. A passing attempt quiz score of 75% or greater is required to advance to the next lesson. You may re-watch and re-attempt lesson activities as many times as needed. At the end of each topic, you will have to pass a summative assessment. A score of 75% or higher is required to pass an assessment. Keep in mind that the recorded score for each final assessment will be the **average** of all attempts. It is in your best interest to pay close attention to the content and repeat lessons more than once to ensure you pass the assessment on the *first attempt*.

Within the lessons, listen, view, read, or engage as needed with the content on screen. It is important to note that quiz questions can come from *any* content provided, including information from videos, pop-ups, and links to further information. (In the case of links to outside websites in Constructing Your Future, you will only be quizzed on content found on the linked page.)

#### **COURSE MATERIALS**

This is a self-paced online course where all lessons and learning resources are contained within the course. All training materials will be provided through the course after logging in with the credentials provided. Access to these materials is dependent upon an active internet connection and use of the latest version of either Google Chrome, Firefox, Microsoft Edge, or Safari internet browsers. Up-to-date Chromebooks, Mac and Windows operating systems can be used to access the course, including iPads and tablets. Please note that a screen of 7" or larger is needed to provide an optimal learning experience.

#### **COURSE STRUCTURE & GRADING**

Electrical Interim Credentials is composed of 50 lessons that, in total, represent the five core courses taken by first year electrical apprentices who have been accepted into our affiliated registered apprenticeship programs across the country. Each lesson includes elements such as:

ELEMENT	PURPOSE
Lessons	Instructional content.
Reality Checks	Opinion or personality-based questions designed to give honest feedback based on honest answers.
Knowledge Checks	Questions based on instructional content to help you gage your understanding of the material.
Activities	Interactive experiences designed to reinforce the lesson learning objective.
Quizzes	End-of-lesson quizzes to assess how well you recall and understand the content within the lesson.*
Topic Assessments	End-of-topic assessments to assess how well you recall and understand the content presented throughout the unit.*

<sup>\*</sup> Minimum score of 75% required to move forward.

To complete the Interim Credentials training, you must complete all course content. Your score for the course will be based on the average of all lesson quizzes. You may retake quizzes and assessments as many times as you'd like. The score recorded for each lesson quiz is the average of your attempt scores.

The course is complete when the minimum requirements of all five topics are met by earning a score of 75% or higher. Upon successful completion of the entire course, you will receive a completion certificate that is recognized by *electrical training ALLIANCE*-affiliated electrical apprenticeship programs across the country.

Those who earn the certification are encouraged to use it to apply to one of these apprenticeship programs. Our training centers vary in how they will recognize this certification and provide benefits to those who do and apply for acceptance into an affiliated apprenticeship program. Benefits can include direct entry (bypassing all application requirements), direct to interview (bypassing aptitude testing if normally required), and advanced placement (either credit for the five courses is granted so they do not have to be taken again once accepted into the program or start the apprenticeship program earning a higher wage than those who don't hold the certification).

	TOPIC	ASSESSMENTS
1	Constructing Your Future	Quizzes Topic Assessment
2	Electrical Job Information 1	Quizzes Topic Assessment
3	Applied Codeology Based on the 2023 NEC	Quizzes Topic Assessment
4	Electrical Theory 1: Direct Current	Quizzes Topic Assessment
5	Construction Drawings	Quizzes Topic Assessment

## **TOPIC SUMMARIES**

Lesson	Торіс	Summary
0	Course Overview, Structure & Navigation	
1-7	Constructing Your Future	This topic provides an overview of what to expect from construction trades apprenticeship programs. The course starts out with a discussion of the skills, interests, and mindset that will best serve an apprentice in a construction trades apprenticeship program. The course continues with an overview of the characteristics and benefits of different apprenticeship programs, the different construction trades, and the career paths that can open to the successful apprentice. The course then covers what it means to dress professionally, the hazards of drug and alcohol abuse in the construction industry, the impact of your online image and cell phone use, considerations related to personal financial management, the importance of developing a safety mindset, and the many hazards that can be present in construction work and how to mitigate or avoid them. Finally, the course concludes with an exploration of the personal skills and attributes that will help an apprentice succeed in any apprenticeship program.
8-19	Electrical Job Information 1	In <i>Electrical Job Information 1</i> , you will learn about the typical workplace of an Electrical Worker and the importance of safety and awareness on the jobsite. You also will learn to identify some basic tools and common materials of the electrical trade. The course covers the basics of insulated conductors and teaches how to choose and install anchors and fasteners. Lessons explain the types of building construction, conductor installation, and devices and switches. The course closes with an introduction to firestopping and sizing building wire.

20-31	Applied Codeology Based on the 2023 NEC	The Applied Codeology, Navigating the 2020 <i>NEC</i> course will help you use and apply an efficient method to categorize and locate requirements in the <i>National Electrical Code (NEC)</i> . Through repetition and thorough understanding of the "Plan" - "Build" - "Use" concepts, you will gain confidence in using the 2023 <i>NEC</i> .
32-41	Electrical Theory 1: Direct Current	This course covers the electrical theory needed to work with and examine basic direct current (DC) electrical circuits. Beginning with the language and component descriptions of the items that make up a typical DC electrical circuit, this course then methodically covers how to analyze series, parallel, and finally, combination (series-parallel) DC circuits. With the knowledge gained in being able to calculate component and total values for these circuit connections, the course then introduces applications of DC circuits, magnetism, electromagnetism, and electrical generation.
42-49	Construction Drawings	Because nearly all construction projects are defined to a high degree of accuracy using drawings long before the project begins, the ability to read and accurately interpret them is one of the most important skills for Electrical Workers. Construction drawings is a broad term that encompasses not only two- and three-dimensional drawings, but also 360-degree images and three-dimensional renderings, which can be manipulated by the construction worker to obtain a better understanding of the design intent for the project. The learner will be given the skills to utilize and interpret each of these types of construction drawings.
50	Completion Certificate	Upon successful completion of lessons 1-49, the final certificate will appear here. This is the certification needed when applying to one of our affiliated registered apprenticeship programs throughout the country to be considered for advanced standing.

### **LEARNING OBJECTIVES BY LESSON**

Lesson	Topic	Learning Objective	
	CONSTRUCTING YOUR FUTURE (CYF)		
1	Constructing Your Future: About This Topic	Directions for completing CYF lessons.	
2	What to Expect	<ol> <li>Recall what to expect from this curriculum.</li> <li>Understand how this course works to educate and prepare individuals for acceptance into apprenticeship.</li> <li>Identify the basic skills required to begin a successful apprenticeship.</li> </ol>	
3	Opportunities Abound	<ol> <li>Recognize the opportunities and benefits that the right apprenticeship program can provide.</li> <li>Contrast the characteristics and benefits of different apprenticeship programs.</li> <li>Identify the role of workers in each of the major construction trades and select the best path forward to construct your future.</li> </ol>	
4	Personal Responsibilities & Expectations	<ol> <li>Describe how to dress professionally as a construction apprentice.</li> <li>Identify the signs and hazards of drug and alcohol abuse in the construction industry.</li> <li>Apply best practices for your cell phone and social media use and recognize the impact your digital footprint can have on your career in the real world.</li> <li>Explain how to survive on apprentice wages by managing your finances wisely.</li> </ol>	
5	Safety Never Takes a Break	<ol> <li>Recognize the innate risks in everyday surroundings and identify how to avoid injuries.</li> <li>Understand the most common safety hazards on a construction site and identify ways to prevent them.</li> <li>Identify the role of personal protective equipment and select the right equipment for the job.</li> </ol>	
6	What It Takes to Succeed	<ol> <li>Recognize what it takes to excel in apprenticeship from Day 1.</li> <li>Demonstrate the critical skills necessary for success and the attributes that will increase your earning potential.</li> <li>Acknowledge the mental and physical resources needed to succeed in a construction trade.</li> <li>Understand what good workmanship is (and is not).</li> <li>Cultivate a good work ethic.</li> </ol>	
7	CYF Topic Assessment	Average score of 75% or above is required to continue.	

	ELECTRICAL JOB INFORMATION 1 (EJI-1)		
8	Electrical Job Information 1: About This Topic	1. Directions for completing EJI-1 lessons.	
9	Safety & Awareness in the Workplace of an Electrical Worker	<ol> <li>List good housekeeping hints.</li> <li>Identify safe workplace procedures.</li> <li>Identify the soft skills necessary for an Electrical Worker.</li> <li>Recognize the hazards around electrical circuits and the potential dangers resulting from electrical shock.</li> <li>Analyze the factors that determine the severity of electrical shock and compare the effects of various shock current intensities.</li> <li>Recognize the role that grounding and circuit protection play in protecting equipment and personnel.</li> <li>Identify the basic types of PPE used by an Electrical Worker.</li> <li>Identify safe methods and work practices for using ladders.</li> <li>Identify safe methods and work practices for using aerial lifts.</li> <li>Recognize the potential dangers of falling objects from ladders, scaffolds, and mobile platforms.</li> <li>Distinguish between a confined space and a permitrequired confined space.</li> <li>Recognize the duties of the authorized entrant, attendant, and entry supervisor when working in permit-required confined spaces.</li> <li>Identify the procedures when summoning rescue or emergency services for confined space operations.</li> </ol>	
10	Identifying Some Basic Tools & Common Materials of the Electrical Trade	<ol> <li>Identify commonly used tools of the trade.</li> <li>Demonstrate the proper selection of tools.</li> <li>Determine the safe application and method of care for tools.</li> <li>Identify commonly used materials of the trade.</li> </ol>	
111	Basics of Insulated Conductors	<ol> <li>Identify electrical characteristics of an atom.</li> <li>Recognize basic conductors.</li> <li>Identify the properties of residential and commercial wire and cable.</li> <li>Identify the common stranding types.</li> <li>Identify the properties of industrial wire and cable.</li> <li>Identify the properties of metal clad (MC) cable.</li> <li>Identify the properties of THHN conductors.</li> <li>Identify the properties of nonmetallic sheath cable.</li> <li>Identify the properties of underground feeder cable.</li> </ol>	
12	Choosing & Installing Anchors and Fasteners	<ol> <li>Identify the factors needed to determine the type of fastener to use for various applications.</li> <li>Identify the basic anchor types, the materials they are made from, and the type of environment each is designed for.</li> <li>Recognize the importance of embedment depth and spacing requirements and calculate how</li> </ol>	

		different criteria determine the diameter and length of fastener to be selected.  4. Indicate the steps required to safely and properly install fasteners.
13	Types of Building Construction	<ol> <li>Identify the International Building Code         (IBC) classifications of buildings based on         construction type.</li> <li>Contrast different building construction methods         including wood, steel, and masonry base         construction.</li> <li>Recognize the precautions necessary when drilling         or saw-cutting prestressed concrete.</li> </ol>
14	Conductor Installation	<ol> <li>Recognize the need for appropriate personal protective equipment (PPE) and work area controls for a wire pull.</li> <li>Recognize the proper installation safety procedures for a wire pull.</li> <li>Identify common tools, materials, and equipment for a wire pull.</li> <li>Identify general field practices for conductor installations.</li> <li>Select the proper technique for conductor installation in conduit.</li> <li>Select the proper technique for conductor installation in cable tray.</li> <li>Recognize considerations for conductors in vertical installations.</li> <li>Select the proper technique for installing conductors below ground.</li> <li>Recognize considerations for aerial installations.</li> <li>Recognize advantages for a typical pull calculation for cable installations.</li> </ol>
15	Devices & Switches	<ol> <li>Define a wiring device and an outlet according to the NEC and describe the difference between them.</li> <li>Identify the various components of wiring devices and outlets.</li> <li>Select the proper connection method for a particular application.</li> <li>Recognize the applications of "specialty" wiring devices and receptacles, such as isolated ground, hospital grade, and ground-fault circuit interrupters.</li> <li>Demonstrate the methods of terminating (and grounding) wiring devices and outlets.</li> <li>Identify the use of wiring devices and outlets within circuits composed of "non-copper" conductors.</li> </ol>
16	Introduction to Firestopping	<ol> <li>Recognize why and what code requirements are necessary, related to penetrations in fire-resistant rated assemblies.</li> <li>Identify fire-resistant rated assemblies and various penetration types in the assemblies.</li> <li>Identify firestop system testing procedures and ratings.</li> <li>Select various firestopping materials and indicate how each material seals an opening.</li> <li>Determine how to select a suitable firestop system using the firestop system nomenclature.</li> </ol>

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		<ol><li>Indicate the steps required to properly install a firestop system.</li></ol>
17	Sizing Building Wire	<ol> <li>Demonstrate your skill to convert different engineering units for conductor area.</li> <li>Calculate the resistance of a conductor.</li> <li>Identify the differences of copper and aluminum conductors.</li> <li>Identify the construction and application of low-voltage cables.</li> </ol>
18	Topic Review	Practice Quiz
19	Topic Assessment	Average score of 75% or above is required to continue.
	APPLIED COD	EOLOGY, NAVIGATING THE 2023 NEC
20	Applied Codeology, Navigating the 2023 NEC: About This Topic	Directions for completing Applied Codeology lessons.
21	Overview, Organization and Chapter 1 of the National Electrical Code	<ol> <li>Understand how this topic is structured and navigated.</li> <li>Pre-topic assessment</li> <li>Locate topics within the table of contents of the <i>National Electrical Code</i>.</li> <li>Identify the scope, structure, and hierarchy of content within the chapters and articles of the <i>NEC</i>.</li> <li>Interpret the language of the <i>NEC</i>.</li> <li>Locate definitions and general requirements in the <i>NEC</i>.</li> <li>Demonstrate how to highlight your <i>Code</i> book.</li> </ol>
22	Planning the Installation	<ol> <li>Recall the titles of the articles found in Chapter 2 of the NEC.</li> <li>Locate definitions applicable to Chapter 2 of the NEC.</li> <li>Apply articles, parts, and tables to identify special NEC Chapter 2 requirements.</li> </ol>
23	Building the Installation	<ol> <li>Recall the titles of the articles found in Chapter 3 of the NEC.</li> <li>Locate definitions applicable to Chapter 3 of the NEC.</li> <li>Identify the general requirements for wiring methods and materials.</li> <li>Recognize conductors for general wiring.</li> <li>Apply articles, parts, and tables to identify special NEC Chapter 3 requirements.</li> </ol>
24	Using the Electricity	<ol> <li>Recall the titles of the articles found in Chapter 4 of the NEC.</li> <li>Locate definitions applicable to Chapter 4 of the NEC.</li> <li>Apply articles, parts, and tables to identify special NEC Chapter 4 requirements.</li> </ol>

25	Special Occupancies	<ol> <li>Recall the titles of the articles found in Chapter 5 of the NEC.</li> <li>Locate definitions applicable to Chapter 5 of the NEC.</li> <li>Identify the requirements of Article 500 and their relationship to Articles 501 through 504.</li> <li>Apply articles, parts, and tables to identify special NEC Chapter 5 requirements.</li> </ol>	
26	Special Equipment	<ol> <li>Recall the titles of the articles found in Chapter 6 of the NEC.</li> <li>Locate definitions applicable to Chapter 6 of the NEC.</li> <li>Apply articles, parts, and tables to identify specific NEC Chapter 6 requirements.</li> </ol>	
27	Special Conditions	<ol> <li>Recall the titles of the articles found in Chapter 7 of the NEC.</li> <li>Locate definitions applicable to Chapter 7 of the NEC.</li> <li>Understand the differences between the three systems in Articles 700, 701, and 702.</li> <li>Apply articles, parts, and tables to identify specific NEC Chapter 7 requirements.</li> </ol>	
28	Communications	<ol> <li>Recall the titles of the articles found in Chapter 8 of the NEC.</li> <li>Locate definitions applicable to Chapter 8 of the NEC.</li> <li>Understand the requirements of Article 800 and their relationship to Articles 805 through 840.</li> <li>Apply articles, parts, and tables to identify specific NEC Chapter 8 requirements.</li> </ol>	
29	Tables and the Informative Annexes	<ol> <li>Recall the tables of Chapter 9 of the NEC.</li> <li>Understand the use and application of the Informative Annexes</li> </ol>	
30	The Codeology Method	<ol> <li>Understand Section 90.3 and its importance to the Codeology method.</li> <li>Identify the major topics and keywords of each chapter of the NEC.</li> <li>Use keywords and topics to find information in the NEC.</li> </ol>	
31	Topic Assessment	Average score of 75% or above is required to continue.	
	ELECTRICAL THEORY 1: DIRECT CURRENT (ET-1)		
32	Electrical Theory 1: About This Topic	<ol> <li>Understand how this topic is organized.</li> <li>Understand how to complete the lessons in this topic.</li> </ol>	
33	Terminology and the Basics	<ol> <li>Recognize the basic structure and characteristics of an atom.</li> <li>Recognize the units of measurement of current, voltage, resistance, and power.</li> <li>Recognize where to find the safety procedures for electrical test instruments.</li> <li>Demonstrate knowledge of the units for amperes</li> </ol>	

		<ul> <li>and identify examples of measurement.</li> <li>5. Demonstrate knowledge of the units for volts and identify examples of measurement.</li> <li>6. Demonstrate knowledge of the units for ohms and identify examples of measurement.</li> <li>7. Demonstrate knowledge of the units for watts and identify examples of measurement.</li> <li>8. Differentiate between electron theory of current flow versus conventional theory of current flow.</li> <li>9. Evaluate the various labels and terms used to describe Ohm's Law.</li> <li>10. Evaluate the various labels and terms used to describe Watt's Law.</li> <li>11. Recognize the various forms of the Ohm's Law formula.</li> <li>12. Recognize the various forms of the Watt's Law formula.</li> <li>13. Solve electrical problems using Ohm's Law and Watt's Law.</li> <li>14. Convert units of measure common to the Electrical Worker.</li> </ul>
34	Series Circuits	<ol> <li>Identify the specific electrical symbol and diagram type.</li> <li>Categorize the type and construction of various standard resistors, including resistance value, wattage rating, and tolerance.</li> <li>Recognize a series DC circuit.</li> <li>Determine the component and total values for a series circuit.</li> </ol>
35	Parallel Circuits	<ol> <li>Recognize the branching and reconnecting of current paths in parallel circuits.</li> <li>Calculate the total resistance for a variety of resistance values in parallel.</li> <li>Determine total and component voltages in a parallel circuit.</li> <li>Determine total and component currents in a parallel circuit.</li> <li>Determine total and component power in parallel circuits.</li> </ol>
36	Combination Circuits	<ol> <li>Determine which components are in series or parallel in a combination circuit to reduce the circuit to an equivalent resistance.</li> <li>Determine the equivalent resistance in a combination circuit.</li> <li>Calculate the total and component current values.</li> <li>Calculate the total and component voltage values.</li> <li>Calculate the component current and voltage values.</li> <li>Calculate the total and component power values.</li> <li>Recognize the effect of the conductor in relation to voltage drop to the loads of circuits.</li> </ol>
37	DC Circuit Analysis	<ol> <li>Use the Laws of Proportionality to solve series and parallel circuits.</li> <li>Use Kirchhoff's Laws to solve for circuit variables in complex circuits.</li> <li>Apply the Superposition Theorem to solve multiple voltage source circuits.</li> </ol>

		<ul> <li>4. Apply Thevenin's and Norton's Theorems to solve for circuit unknowns.</li> <li>5. Identify formulas used for the various theorems covered in this module including their applications in series and parallel circuits.</li> </ul>	
38	Switches & Conductors	<ol> <li>Identify the relationship between materials, resistance, and size for wires or conductors.</li> <li>Determine the concepts of current flow for open, closed, and short circuits.</li> <li>Determine various switch configurations and uses.</li> </ol>	
39	Magnetism & Electromagnetism	<ol> <li>Identify and define key terms related to magnetism and electromagnetism.</li> <li>Determine the direction of the magnetic field created when current flows through a conductor using the Left-Hand Rule for conductors.</li> <li>Identify the properties that affect the strength of the magnetic field created by a coil and the polarity using the Left-Hand Rule for coils.</li> <li>Identify the properties that need to be present to induce voltage in a conductor and then determine the direction of current flow using the Left-Hand Rule for Generators.</li> <li>Determine the basic principles, construction, and operation of simple DC and AC generators.</li> </ol>	
40	Optional Support - Labs	<ol> <li>This lesson provides access to the Electrical Theory Simulator (ETS) and labs, grouped based on the lessons where that information is learned.</li> </ol>	
41	Topic Assessment	Average score of 75% or above is required to continue.	
	CONSTRUCTION DRAWINGS (CD)		
42	Construction Drawings: About This Topic	<ol> <li>Directions for navigating and successfully completing Construction Drawings.</li> </ol>	
43	Introduction to Blueprints and the Design Process	<ol> <li>Recognize the conceptual design process and its importance to the construction process.</li> <li>Review the evolution of construction and introduce the documentation process.</li> <li>List the standards used for design professionals.</li> <li>Identify the standard components used in construction documentation.</li> </ol>	
44	Scaling & Dimensions	<ol> <li>Interpret the principles of standardized scaling and dimensioning, and the clarity they bring to architectural plans.</li> <li>Demonstrate the usefulness of, and ability to interpret, the different scales used for various types of drawings.</li> <li>Differentiate different scales and types of scales in their differing applications.</li> </ol>	
45	Plan Views	<ol> <li>Identify the aspects of plan views and the information they provide.</li> <li>Identify the types of plan views and the details</li> </ol>	

		provided in each view.  3. Recognize the specific information provided in "trade-specific" drawings.
46	Elevations	<ol> <li>Recognize how elevation views are created and list the information they provide.</li> <li>Identify the types of elevation drawings.</li> <li>Recognize scales used on elevation drawings.</li> <li>Differentiate between elevation views and other drawing types.</li> </ol>
47	Details and Sections	<ol> <li>Identify the different types of detail views, how they are used, and how they relate to other drawing types.</li> <li>Identify the different types of section views, how they are used, and how they relate to other drawing types.</li> <li>Identify the similarities and differences between details and section views.</li> </ol>
48	Schedules and Specifications	<ol> <li>Identify the role of schedules in relation to construction and the most common applications.</li> <li>Identify the role of specifications in relation to construction and the most common applications.</li> <li>Demonstrate the ability to locate the needed information from within a set of specifications based on the MasterFormat.</li> </ol>
49	Topic Assessment	Average score of 75% or above is required for completion.
50	Interim Credentials Completion Certificate	Upon completion of all lessons you will be able to print a Certificate of Completion for this course.