Course Name	**Commercial and Industrial Wiring (2023 NEC)**
Credit Hours	8 Hours
Instructor(s)	Jerry Durham
Fee	$85.00
Reference Materials	NFPA 70 National Electrical Code 2023 Edition

Course Description

This course will cover the definitions of 2023 NEC terms and requirements in the 2023 NEC for commercial and industrial electrical installations - including branch circuits; feeders; overcurrent protection; grounding and bonding; wiring methods; conductors for general wiring; outlet, device, pull, and junction boxes; conduit and raceways; switches and receptacles; switchboards and panelboards; motors, motor circuits, and controllers; generators; transformers; temporary installations; and industrial machinery. This course has no prerequisites.

Learning Objectives

At the completion of the course, students will be able to:

- Explain the overall scope of the National Electrical Code as it pertains to commercial and industrial installations.
- Define “Accessible” as applied to equipment.
- List the qualities that testing agencies check when examining electrical equipment.
- Identify the minimum value required for the interrupting rating of a circuit breaker.
- Explain why an equipment’s terminal temperature rating is used to select the conductor ampacity.
- Describe when a feeder disconnect requires ground fault circuit interrupter (GFCI) protection.
- List examples of continuous and non-continuous loads.
- Calculate the minimum ampacity required of a feeder tap.
- Describe the purpose of an effective ground-fault current path.
- Interpret Table 310.12 to size phase conductors for dwelling unit services.
- List the basic requirements for sizing outlet and device boxes.
- List the general requirements for providing overcurrent protection to flexible bus systems.
- Describe the proper procedure for installing conductors in conduit.
- Identify when and how PVC, as a complete system, is required to be supported.
- Understand the importance of using switches within their specified ratings and the types of permitted loads on switches.

- Identify where flexible cords are permitted to be used.
- Describe the level of detailed required for circuit identification.
- Identify when more than one motor is allowed on a branch circuit.
- Describe how overcurrent protection protects a motor control center (MCC).
- Identify when a motor must have a disconnecting means within sight of the motor.
- Identify installations or activities that require ground fault circuit interrupter (GFCI) protection for personnel.
- Calculate the minimum ampacity required of feeder supply conductors for an industrial machine.

Equipment Requirements

You must have an active, working internet connection to access this course online, as well as a platform to access the internet, such as a computer, tablet, or phone. All popular web browsers are supported, including Google Chrome, Mozilla Firefox, Safari, and Opera. No specialized software, speaker, microphone, or web camera is required.

Schedule and Location

This course is available online at any time at www.TradesmanCE.com. Upon enrolling in the course, students will have access for 365 days or until the agency-issued course expiration date, whichever comes first. After the access expiration date, the course will be removed from the student's account, and any progress in the course will be lost. Before the access expiration date, the student may sign in and out of the course as many times as needed to complete the course.

Student Support

Both general and technical support is available to the student before, during, and after taking the course online. Students have access to general customer support via phone, chat, and email. Students have access to the course instructor via a contact form in the course and email. All questions, concerns, and comments received will be responded to within one business day.

Participation/Interactivity Verification

Inactivity Timer - Students are automatically logged out of the training after 15 minutes if the system does not sense interactivity (e.g., a mouse click or typing).

Timed Logs - Per our company's record retention policy, each student's every log-in, log-out, and lesson/assessment completion time is tracked and retained as part of the student record.

Review Questions - The student must successfully answer all review questions between sections to get credit for the course. Students cannot progress in the course until each question has been answered and each quiz has been successfully passed. More information about the quizzes/exams can be found under Assessment Details.

Global Timer - Students will not get credit until they spend a minimum of 240 active minutes total in the course.

Identity Verification

Unique Username/Password - Each student that wants to complete a training course with us must create an account by registering a unique personal email address and password. The student must enter this unique identifier every time they want to access the course after logging out.

Assessment Details

Quizzes - The student must complete all quizzes with a score of at least 75% in order to get credit for the course.

Commercial & Industrial Wiring (2023 NEC) Timed Syllabus

Section	Title	Questions	Minutes*
1	**Introduction**		**24**
	90.1 Scope		
	90.2 (A) Practical Safeguarding		
	90.2 (B) Adequacy		
	90.2 (C) Installations Covered		
	90.2 (D) Installations Not Covered		
	90.3 Code Arrangement		
	Quiz	**6**	**6**
2	**Definitions**		**40**
	100 Accessible: Equipment and Wiring Methods		
	100 Accessible (Readily Accessible)		
	100 Branch Circuit		
	100 Continuous Load		
	100 Feeder		
	100 Grounded. Grounding		
	100 Ground-Fault Protection of Equipment		
	100 In Sight From (Within Sight From, Within Sight)		
	100 Qualified Person		
	100 Separately Derived System		
	Quiz	**10**	**10**
3	**Requirements for Electrical Installations**		**56**
	110.3 (A) Examination, Identification, Installation, and Use of Equipment		
	110.3 (B) Installation and Use		
	110.9 Interrupting Rating		
	110.14 (C) Electrical Connections - Temperature Limitations		
	110.14 (D) Terminal Connection Torque		
	110.18 Arcing Parts		
	110.22 Identification of Disconnecting Means		
	110.24 Available Fault Rating		
	110.26 (A)(1)(2)(3) Depth, Width, and Height of Working Space		
	110.26 (C)(1) and (2) Large Equipment		
	110.26 (D) and (E) Illumination of Working Space and Dedicated Equipment Space		
	Table 110.28 Enclosure Selection		
	110.33 Entrance to Enclosures and Access to Work Space		
	110.34 (A) Working Space		
	Quiz	**14**	**14**
4	**Branch Circuits**		**20**
	210.18 Rating		
	210.8 (B) Ground-Fault Circuit-Interrupter Protection for Personnel		
	210.19 Conductors - Minimum Ampacity and Size		
	210.21 Outlet Devices		
	210.63 Equipment Requiring Servicing		
	Quiz	**5**	**5**
5	**Feeders**		**8**
	215.2 (A)(1) Feeders. Minimum Rating and Size		
	215.10 Ground-Fault Protection of Equipment		
	Quiz	**2**	**2**
6	**Outside Branch Circuits and Feeders**		**12**
	225.30 Number of Supplies		
	225.31 (A) and (B) Disconnecting Means		

	235.360 Clearances Over Roadways, Walkways, Rail, Water, and Open Land		
	Quiz	**3**	**3**
7	**Overcurrent Protection**		**16**
	240.6 Standard Ampere Ratings		
	240.21 (B) Feeder Taps		
	240.24 (A) Location in or on Premises. Accessibility		
	245.21 Circuit-Interrupting Devices		
	Quiz	**4**	**4**
8	**Grounding and Bonding**		**40**
	100 Ground-Fault Current Path, Effective (Effective Ground-Fault Current Path)		
	250.30 (A) Grounding Separately Derived AC Systems, Grounded Systems		
	250.30 (B) and (C) Grounding Separately Derived AC Systems, Ungrounded Systems and Outdoor Source		
	250.32 Buildings or Structures Supplied by Feeder(s) or Branch Circuit(s)		
	250.50 Grounding Electrode System		
	250.52 Grounding Electrodes		
	250.64 Grounding Electrode Conductor Installation		
	250.66 Size of Alternating-Current Grounding Electrode Conductor		
	250.118 Types of Equipment Grounding Conductors		
	250.122 (F) Size of Equipment Grounding Conductors in Parallel		
	Quiz	**10**	**10**
9	**Wiring Methods**		**16**
	300.3 (B) & 300.3 (B)(1) Conductors of the Same Circuit & Paralleled Installations		
	300.4 (G) Insulated Fittings		
	300.5 (A) Minimum Cover Requirements		
	300.14 Length of Free Conductors at Outlets, Junctions, and Switch Points		
	Quiz	**4**	**4**
10	**Conductors for General Wiring**		**12**
	310.10 Uses Permitted (A) through (F)		
	310.10 (G) Conductors in Parallel		
	310.12 Single-Phase Dwelling Service and Feeders		
	Quiz	**3**	**3**
11	**Outlet, Device, Pull, and Junction Boxes**		**12**
	314.24 Dimensions of Boxes		
	315.16 Marking for Type MV Cables and Conductors & 315.17 Marking for Type MV Cable Joints and Terminations		
	315.32 Uses Permitted for Type Medium Voltage Cables, Cable Joints, and Terminations		
	Quiz	**3**	**3**
12	**Conduit and Raceways**		**28**
	371.17 Overcurrent Protection of Flexible Bus Systems		
	371.18 Flexible Bus Systems Installation		
	314.16 Box Fill Calculations		
	398.15 Exposed Work		
	315.44 Shielding & 315.45 Shielding at Type MV Cable Joints and Terminations		
	352.10 Uses Permitted for Rigid Polyvinyl Chloride Conduits		
	352.44 Expansion Fittings		
	Quiz	**7**	**7**
13	**Switches and Receptacles**		**12**
	404.14 Rating and Use of Switches		
	406.3 Receptacle Rating and Type		
	406.4 (D) Receptacle Replacements		
	Quiz	**3**	**3**
14	**Switchboards and Panelboards**		**16**
	406.12 Tamper-Resistant Receptacles		

	424.93 Installation of Electric Radiant Heating Panels and Heating Panel Sets		
	410.10 Luminaires in Specific Locations		
	410.10 (A) through (F) Installation		
	Quiz	**4**	**4**
15	**Motors, Motor Circuits, and Controllers**		**38**
	430.6 Conductor Ampacity and Motor Rating Determination		
	430.7 Marking on Motors and Multimotor Equipment & 430.8 Marking on Controllers		
	430.22 Single Motor		
	430.24 Several Motors or a Motor(s) and Other Load(s)		
	430.32 Continuous Duty Motors – Overload Protection		
	430.52 Rating or Setting for Individual Motor Circuit		
	430.53 Several Motors or Loads on One Branch Circuit		
	430.94 Overcurrent Protection		
	430.102 (A) Disconnecting Means Location. Controller		
	430.102 (B) Disconnecting Means Location. Motor		
	430.107 Readily Accessible		
	430.109 Type		
	Quiz	**12**	**12**
16	**Generators**		**6**
	Section 445.13 (A) Ampacity of Conductors. General. Conductor Ampacity		
	Section 445.18 Disconnecting Means. 445.19 Emergency Shutdown of Prime Mover		
	Quiz	**2**	**2**
17	**Transformers**		**9**
	450.1 Scope		
	Table 450.3 (B) Maximum Rating of Overcurrent Protection for Transformers 1000 Volts and Less		
	450.13 (A) & (B) Accessibility. Open and Hollow Space Installations		
	Quiz	**3**	**3**
18	**Temporary Installations**		**6**
	590.3 and 590.4(D) Time Constraints. Receptacles		
	590.6 (A)(1) GFCI Protection for Personnel		
	Quiz	**2**	**2**
19	**Industrial Machinery**		**9**
	670.3 Machine Nameplate Data		
	670.4 (A) Supply Conductors and Overcurrent Protection – Size		
	670.4 (B) & (C) Disconnecting Means and Overcurrent Protection		
	Quiz	**3**	**3**
	Totals:	**100**	**480**
	Student Minimum Time Required:		**480**