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 student may re-activate their course if the course approval has not expired. If they do not re-activate, 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 email. All questions, concerns, and comments received will be responded to within one business day.

Participation/Interactivity Verification

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 - After each section of text, students must answer a review question. Students cannot progress in the course until the question between sections has been answered correctly.

Global Timer - Students will not get credit until they spend a minimum of 400 active minutes total in the course.

Identity Verification

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

Assessment Details

Review Questions - The licensee must complete all 100 multiple-choice questions between sections correctly to get credit for the course. If their first response is incorrect, students will have to try again until they choose the correct answer. Question choices are randomized so each participant will have a unique testing experience. This course is set up to allow users to go back through the section questions and re-answer questions while they meet the time requirement.

Regulatory Auditor Access

To review and audit this course, please go to www.TradesmanCE.com. Click on the Login button on the top right and sign into the learning system using the login information below.

Username: uteltester
Password: UTELtester

Commercial & Industrial Wiring (2023 NEC) – Timed Syllabus

Section	Title	Questions	Minutes*
	Introduction		
1	90.1 Scope	**1**	**5**
2	90.2 (A) Practical Safeguarding	**1**	**5**
3	90.2 (B) Adequacy	**1**	**5**
4	90.2 (C) Installations Covered	**1**	**5**
5	90.2 (D) Installations Not Covered	**1**	**5**
6	90.3 Code Arrangement	**1**	**5**
	Definitions		
7	100 Accessible: Equipment and Wiring Methods	**1**	**5**
8	100 Accessible (Readily Accessible)	**1**	**5**
9	100 Branch Circuit	**1**	**5**
10	100 Continuous Load	**1**	**5**
11	100 Feeder	**1**	**5**
12	100 Grounded. Grounding	**1**	**5**
13	100 Ground-Fault Protection of Equipment	**1**	**5**
14	100 In Sight From (Within Sight From, Within Sight)	**1**	**5**
15	100 Qualified Person	**1**	**5**
16	100 Separately Derived System	**1**	**5**
	Requirements for Electrical Installations		
17	110.3 (A) Examination, Identification, Installation, and Use of Equipment	**1**	**5**
18	110.3 (B) Installation and Use	**1**	**5**
19	110.9 Interrupting Rating	**1**	**5**
20	110.14 (C) Electrical Connections - Temperature Limitations	**1**	**5**
21	110.14 (D) Terminal Connection Torque	**1**	**5**
22	110.18 Arcing Parts	**1**	**5**
23	110.22 Identification of Disconnecting Means	**1**	**5**
24	110.24 Available Fault Rating	**1**	**5**
25	110.26 (A)(1)(2)(3) Depth, Width, and Height of Working Space	**1**	**5**
26	110.26 (C)(1) and (2) Large Equipment	**1**	**5**
27	110.26 (D) and (E) Illumination of Working Space and Dedicated Equipment Space	**1**	**5**
28	Table 110.28 Enclosure Selection	**1**	**5**
29	110.33 Entrance to Enclosures and Access to Work Space	**1**	**5**
30	110.34 (A) Working Space	**1**	**5**
	Branch Circuits		
31	210.18 Rating	**1**	**5**
32	210.8 (B) Ground-Fault Circuit-Interrupter Protection for Personnel	**1**	**5**
33	210.19 Conductors - Minimum Ampacity and Size	**1**	**5**
34	210.21 Outlet Devices	**1**	**5**
35	210.63 Equipment Requiring Servicing	**1**	**5**
	Feeders		
36	215.2 (A)(1) Feeders. Minimum Rating and Size	**1**	**5**
37	215.10 Ground-Fault Protection of Equipment	**1**	**5**
	Outside Branch Circuits and Feeders		
38	225.30 Number of Supplies	**1**	**5**
39	225.31 (A) and (B) Disconnecting Means	**1**	**5**
40	235.360 Clearances Over Roadways, Walkways, Rail, Water, and Open Land	**1**	**5**
	Overcurrent Protection		
41	240.6 Standard Ampere Ratings	**1**	**5**
42	240.21 (B) Feeder Taps	**1**	**5**
43	240.24 (A) Location in or on Premises. Accessibility	**1**	**5**
44	245.21 Circuit-Interrupting Devices	**1**	**5**
	Grounding and Bonding		

45	100 Ground-Fault Current Path, Effective (Effective Ground-Fault Current Path)	**1**	**5**
46	250.30 (A) Grounding Separately Derived AC Systems, Grounded Systems	**1**	**5**
47	250.30 (B) and (C) Grounding Separately Derived AC Systems, Ungrounded Systems and Outdoor Source	**1**	**5**
48	250.32 Buildings or Structures Supplied by Feeder(s) or Branch Circuit(s)	**1**	**5**
49	250.50 Grounding Electrode System	**1**	**5**
50	250.52 Grounding Electrodes	**1**	**5**
51	250.64 Grounding Electrode Conductor Installation	**1**	**5**
52	250.66 Size of Alternating-Current Grounding Electrode Conductor	**1**	**5**
53	250.118 Types of Equipment Grounding Conductors	**1**	**5**
54	250.122 (F) Size of Equipment Grounding Conductors in Parallel	**1**	**5**
	Wiring Methods		
55	300.3 (B) & 300.3 (B)(1) Conductors of the Same Circuit & Paralleled Installations	**1**	**5**
56	300.4 (G) Insulated Fittings	**1**	**5**
57	300.5 (A) Minimum Cover Requirements	**1**	**5**
58	300.14 Length of Free Conductors at Outlets, Junctions, and Switch Points	**1**	**5**
	Conductors for General Wiring		
59	310.10 Uses Permitted (A) through (F)	**1**	**5**
60	310.10 (G) Conductors in Parallel	**1**	**5**
61	310.12 Single-Phase Dwelling Service and Feeders	**1**	**5**
	Outlet, Device, Pull, and Junction Boxes		
62	314.24 Dimensions of Boxes	**1**	**5**
63	315.16 Marking for Type MV Cables and Conductors & 315.17 Marking for Type MV Cable Joints and Terminations	**1**	**5**
64	315.32 Uses Permitted for Type Medium Voltage Cables, Cable Joints, and Terminations	**1**	**5**
	Conduit and Raceways		
65	371.17 Overcurrent Protection of Flexible Bus Systems	**1**	**5**
66	371.18 Flexible Bus Systems Installation	**1**	**5**
67	314.16 Box Fill Calculations	**1**	**5**
68	398.15 Exposed Work	**1**	**5**
69	315.44 Shielding & 315.45 Shielding at Type MV Cable Joints and Terminations	**1**	**5**
70	352.10 Uses Permitted for Rigid Polyvinyl Chloride Conduits	**1**	**5**
71	352.44 Expansion Fittings	**1**	**5**
	Switches and Receptacles		
72	404.14 Rating and Use of Switches	**1**	**5**
73	406.3 Receptacle Rating and Type	**1**	**5**
74	406.4 (D) Receptacle Replacements	**1**	**5**
	Switchboards and Panelboards		
75	406.12 Tamper-Resistant Receptacles	**1**	**5**
76	424.93 Installation of Electric Radiant Heating Panels and Heating Panel Sets	**1**	**5**
77	410.10 Luminaires in Specific Locations	**1**	**5**
78	410.10 (A) through (F) Installation	**1**	**5**
	Motors, Motor Circuits, and Controllers		
79	430.6 Conductor Ampacity and Motor Rating Determination	**1**	**5**
80	430.7 Marking on Motors and Multimotor Equipment & 430.8 Marking on Controllers	**1**	**5**
81	430.22 Single Motor	**1**	**4**
82	430.24 Several Motors or a Motor(s) and Other Load(s)	**1**	**4**
83	430.32 Continuous Duty Motors – Overload Protection	**1**	**4**
84	430.52 Rating or Setting for Individual Motor Circuit	**1**	**4**
85	430.53 Several Motors or Loads on One Branch Circuit	**1**	**4**
86	430.94 Overcurrent Protection	**1**	**4**
87	430.102 (A) Disconnecting Means Location. Controller	**1**	**4**
88	430.102 (B) Disconnecting Means Location. Motor	**1**	**4**
89	430.107 Readily Accessible	**1**	**4**
90	430.109 Type	**1**	**4**

	Generators		
91	Section 445.13 (A) Ampacity of Conductors. General. Conductor Ampacity	**1**	**4**
92	Section 445.18 Disconnecting Means. 445.19 Emergency Shutdown of Prime Mover	**1**	**4**
	Transformers		
93	450.1 Scope	**1**	**4**
94	Table 450.3 (B) Maximum Rating of Overcurrent Protection for Transformers 1000 Volts and Less	**1**	**4**
95	450.13 (A) & (B) Accessibility. Open and Hollow Space Installations	**1**	**4**
	Temporary Installations		
96	590.3 and 590.4(D) Time Constraints. Receptacles	**1**	**4**
97	590.6 (A)(1) GFCI Protection for Personnel	**1**	**4**
	Industrial Machinery		
98	670.3 Machine Nameplate Data	**1**	**4**
99	670.4 (A) Supply Conductors and Overcurrent Protection – Size	**1**	**4**
100	670.4 (B) & (C) Disconnecting Means and Overcurrent Protection	**1**	**4**
	Totals:	**100**	**480**
	Time Required to Complete Course:		**400**

*One minute of time per question is included in the total to answer the questions.