

ELTR 1025 - Intermediate Electrical Concepts II (version 201412L)

Course Title Course Development Learning Support

Intermediate Electrical Concepts II Standard No

Course Description

This course continues to introduce those specific job skills needed for a typical electrician. Topics in this course include pull and junction boxes, conductor installations, terminations and splices, circuit breakers and fuses, and control systems fundamentals.

Pre-requisites

Pre-requisites: None

Regstr. Co-requisites

Regstr. Co-requisites: None

True Co-requisites

True Co-requisites: None

Course Length

	Lecture Contact Time	Regular Lab Type	Reg. Lab Contact Time	Other Lab Type	Oth. Lab Contact Time	Total Contact Hrs
Contact Hours Per Week	3 hrs	N/A	0 hrs	Practicum	3 hrs	6 hrs
Contact Min/Hrs Per Semester	2250 min		0 min		2250 min	90 hrs
	Lecture Credit Hours		Lab Credit Hours	Total Credit hours		WLU
Semester Credit Hours	3		1	4		146.25

Competencies & Outcomes

Order Description

1 Pull and Junction Boxes

Order	Description	Learning Domain	Level of Learning
1	Describe the different types of nonmetallic and metallic pull and junction boxes.	Cognitive	Comprehension
2	Properly select, install, and support pull and junction boxes and their associated fittings.	Psychomotor	Guided Response
3	Describe the National Electrical Code® (NEC®) regulations governing pull and junction boxes.	Cognitive	Comprehension
4	Size pull and junction boxes for various applications.	Cognitive	Application
5	Understand the NEMA and IP classifications for pull and junction boxes.	Cognitive	Comprehension
6	Describe the purpose of conduit bodies and Type FS boxes.	Cognitive	Comprehension
7	Identify various NEMA boxes.	Cognitive	Knowledge
8	Identify various conduit bodies and fittings.	Cognitive	Knowledge

2 Conductor Installations

Order	Description	Learning Domain	Level of Learning
1	Explain the importance of communication during a cable-pulling operation.	Cognitive	Comprehension
2	Plan and set up for a cable pull.	Psychomotor	Guided Response
3	Set up reel stands and spindles for a wire-pulling installation.	Psychomotor	Guided Response
4	Explain how mandrels, swabs, and brushes are used to prepare conduit for conductors.	Cognitive	Comprehension
5	Properly install a pull line for a cable-pulling operation.	Psychomotor	Guided Response
6	Explain how and when to support conductors in vertical conduit runs.	Cognitive	Comprehension
7	Describe the installation of cables in cable trays.	Cognitive	Comprehension
8	Calculate the probable stress or tension in cable pulls.	Cognitive	Application
9	Prepare multiple conductors for pulling in a raceway system.	Psychomotor	Guided Response
10	Prepare multiple conductors for pulling using a wire-pulling basket.	Psychomotor	Guided Response

3 Cable Tray

Order	Description	Learning Domain	Level of Learning
1	Describe the components that make up a cable tray assembly.	Cognitive	Comprehension
2	Explain the methods used to hang and secure cable tray.	Cognitive	Comprehension
3	Describe how cable enters and exits cable tray.	Cognitive	Comprehension
4	Select the proper cable tray fitting for the situation.	Psychomotor	Guided Response
5	Explain the National Electrical Code® (NEC®) requirements for cable tray installations.	Cognitive	Comprehension
6	Select the required fittings to ensure equipment grounding continuity in cable tray systems.	Psychomotor	Guided Response
7	Interpret electrical working drawings showing cable tray fittings.	Cognitive	Application
8	Size cable tray for the number and type of conductors contained in the system.	Cognitive	Application
9	Generate a list of materials for a cable tray layout including all components required and the fasteners required to complete the system.	Cognitive	Application
10	Join two straight, ladder-type cable tray sections together.	Psychomotor	Guided Response

4 Conductor Terminations and Splices

Order	Description	Learning Domain	Level of Learning
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1	Describe how to make a good conductor termination.	Cognitive	Comprehension
2	Prepare cable ends for terminations and splices and connect using lugs or connectors.	Psychomotor	Guided Response
3	Train cable at termination points.	Psychomotor	Guided Response
4	Understand the National Electrical Code® (NEC®) requirements for making cable terminations and splices.	Cognitive	Comprehension
5	Demonstrate crimping techniques.	Psychomotor	Guided Response
6	Select the proper lug or connector for the job.	Cognitive	Application
7	Terminate conductors using selected crimp-type and mechanical-type terminals and connectors.	Psychomotor	Guided Response
8	Terminate conductors on a terminal strip.	Psychomotor	Guided Response
9	Insulate selected types of wire splices and/or install a motor connection kit.	Psychomotor	Guided Response

5 Grounding and Bonding

Order	Description	Learning Domain	Level of Learning
1	Explain the purpose of grounding and bonding and the scope of NEC Article 250.	Cognitive	Comprehension
2	Distinguish between a short circuit and a ground fault.	Cognitive	Application
3	Define the National Electrical Code® requirements related to bonding and grounding.	Cognitive	Knowledge
4	Distinguish between grounded systems and equipment grounding.	Cognitive	Application
5	Use NEC Table 250.66 to size the grounding electrode conductor for various AC systems.	Cognitive	Application
6	Explain the function of the grounding electrode system and determine the grounding electrodes to be used.	Cognitive	Comprehension
7	Define electrodes and explain the resistance requirements for electrodes using NEC Section 250.56.	Cognitive	Knowledge
8	Use NEC Table 250.122 to size the equipment grounding conductor for raceways and equipment.	Cognitive	Application
9	Explain the function of the main and system bonding jumpers in the grounding system and size the main and system bonding jumpers for various applications.	Cognitive	Comprehension
10	Size the main bonding jumper for a service utilizing multiple service disconnecting means.	Cognitive	Application
11	Explain the importance of bonding equipment in clearing ground faults in a system.	Cognitive	Comprehension
12	Explain the purposes of the grounded conductor (neutral) in the operation of overcurrent devices.	Cognitive	Comprehension
13	Using the proper fittings, connect one end of a No. 4 AWG bare copper grounding wire to a length of 3/4" galvanized water pipe and the other end to the correct terminal in a main panelboard.	Psychomotor	Guided Response

14	Install two lengths of Type NM cable in a switch box using Type NM cable clamps: • Strip the ends of the cable to conform with National Electrical Code® requirements. • Secure the cable in the switch box and tighten the cable clamps. • Connect and secure the equipment grounding conductors according to NEC® requirements, and secure to the switch box with either a ground clip or a grounding screw.	Psychomotor	Guided Response
15	Size the minimum required grounding electrode conductor for a 200A service fed by 3/0 copper.	Cognitive	Application
16	Size the minimum required equipment grounding conductor in each conduit for a 400A feeder gap using two parallel runs of 3/0 copper.	Cognitive	Application
17	Size the minimum required bonding jumper for a copper water pipe near a separately derived system (transformer) where the secondary conductors are 500 kcmil copper.	Cognitive	Application

6 Circuit Breakers and Fuses

Order	Description	Learning Domain	Level of Learning
1	Explain the necessity of overcurrent protection devices in electrical circuits.	Cognitive	Comprehension
2	Define the terms associated with fuses and circuit breakers.	Cognitive	Knowledge
3	Describe the operation of a circuit breaker.	Cognitive	Comprehension
4	Apply the National Electrical Code® (NEC®) requirements for overcurrent devices.	Cognitive	Application
5	Describe the operation of single-element and time delay fuses.	Cognitive	Comprehension
6	Identify the following on one or more circuit breaker(s) and fuse(s): • Number of poles • Load rating • Voltage rating • Amperage interrupting rating	Psychomotor	Guided Response

7 Control Systems and Fundamental Concepts

Order	Description	Learning Domain	Level of Learning
1	Describe the operating principles of contactors and relays.	Cognitive	Comprehension
2	Select contactors and relays for use in specific electrical systems.	Cognitive	Application
3	Explain how mechanical contactors operate.	Cognitive	Comprehension
4	Explain how solid-state contactors operate.	Cognitive	Comprehension
5	Install contactors and relays according to the NEC® requirements.	Psychomotor	Guided Response
6	Select and install contactors and relays for lighting control.	Psychomotor	Guided Response
7	Read wiring diagrams involving contactors and relays.	Cognitive	Application
8	Describe how overload relays operate.	Cognitive	Comprehension
9	Connect a simple control circuit.	Psychomotor	Guided

			Response
10	Test control circuits.	Psychomotor	Guided Response
11	Mount and connect a 120V lighting contactor with a three-wire pushbutton control.	Psychomotor	Guided Response