

ELTR 1015 - Intermediate Electrical Concepts I (version 201412L)

Course Title Course Development Learning Support

Intermediate Electrical Concepts I Standard No

Course Description

This course introduces the student to specific skill components needed to be successful as an electrician. Topics include reading electrical drawings, residential electrical services, test equipment, alternating current, motor theory and applications and basic electrical installation.

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 Basic Electrical Construction Drawings

Order	Description	Learning Domain	Level of Learning
1	Explain the basic layout of a set of construction drawings.	Cognitive	Comprehension
2	Describe the information included in the title block of a construction drawing.	Cognitive	Comprehension
3	Identify the types of lines used on construction drawings.	Cognitive	Knowledge
4	Using an architect's scale, state the actual dimensions of a given drawing component.	Psychomotor	Guided Response
5	Interpret electrical drawings, including site plans, floor plans, and detail drawings.	Cognitive	Application
6	Interpret equipment schedules found on electrical drawings.	Cognitive	Application
7	Describe the type of information included in electrical specifications.	Cognitive	Comprehension
8	Make a materials takeoff of the lighting fixtures on a construction drawing.	Psychomotor	Guided Response

2 Residential Electrical Services

Order	Description	Learning Domain	Level of Learning
1	Explain the role of the National Electrical Code in residential wiring and describe how to determine electric service requirements for dwellings.	Cognitive	Comprehension
2	Explain the grounding requirements of a residential electric service.	Cognitive	Comprehension
3	Calculate and select service-entrance equipment.	Cognitive	Application
4	Select the proper wiring methods for various types of residences.	Cognitive	Application
5	Compute branch circuit loads and explain their installation requirements.	Cognitive	Application
6	Explain the types and purposes of equipment grounding conductors.	Cognitive	Comprehension
7	Explain the purpose of ground fault circuit interrupters and tell where they must be installed.	Cognitive	Comprehension
8	Size outlet boxes and select the proper type for different wiring methods.	Cognitive	Application
9	Describe rules for installing electric space heating and HVAC equipment.	Cognitive	Comprehension
10	Describe the installation rules for electrical systems around swimming pools, spas, and hot tubs.	Cognitive	Comprehension
11	Explain how wiring devices are selected and installed.	Cognitive	Comprehension
12	Describe the installation and control of lighting fixtures.	Cognitive	Comprehension
13	For a residential dwelling of a given size, and equipped with a given list of major appliances, demonstrate or explain how to: • Compute lighting, small appliance, and laundry loads. • Compute the loads for large appliances. • Determine the number of branch circuits required. • Size and select the service-entrance equipment (conductors, panelboard, and protective devices).	Psychomotor	Guided Response
14	Select the proper type and size outlet box needed for a given set of wiring conditions.	Psychomotor	Guided Response

3 Electrical Test Equipment

Order	Description	Learning Domain	Level of Learning
1	Explain the operations of and describe the following pieces of test equipment: • Voltmeter • Ohmmeter • Clamp-on ammeter • Multimeter • Megohmmeter • Motor and phase rotation testers	Cognitive	Comprehension
2	Select the appropriate meter for a given work environment based on category ratings.	Cognitive	Application
3	Identify the safety hazards associated with the various types of test equipment.	Cognitive	Knowledge
4	Measure the voltage from line to neutral and neutral to ground.	Psychomotor	Guided Response
5	Use an ohmmeter to measure the value of various resistors.	Psychomotor	Guided Response

4 Alternating Current

Order	Description	Learning Domain	Level of Learning
1	Calculate the peak and effective voltage or current values for an AC waveform.	Cognitive	Application
2	Calculate the phase relationship between two AC waveforms.	Cognitive	Application
3	Describe the voltage and current phase relationship in a resistive AC circuit.	Cognitive	Comprehension
4	Describe the voltage and current transients that occur in an inductive circuit.	Cognitive	Comprehension
5	Define inductive reactance and state how it is affected by frequency.	Cognitive	Knowledge
6	Describe the voltage and current transients that occur in a capacitive circuit.	Cognitive	Comprehension
7	Explain the relationship between voltage and current in the following types of AC circuits: • RL circuit • RC circuit • LC circuit • RLC circuit	Cognitive	Comprehension
8	Explain the following terms as they relate to AC circuits: • True power • Apparent power • Reactive power • Power factor	Cognitive	Comprehension
9	Explain basic transformer action.	Cognitive	Comprehension

5 Motors: Theory and Application

Order	Description	Learning Domain	Level of Learning
1	Define the following terms: • Controller • Duty cycle • Full-load amps • Interrupting rating • Thermal protection • NEMA design letter • Overcurrent • Overload • Power factor • Rated full-load speed • Rated horsepower • Service factor	Cognitive	Knowledge
2	Describe the various types of motor enclosures.	Cognitive	Comprehension
3	Explain the relationships among speed, frequency, and the number of poles in a three-phase induction motor.	Cognitive	Comprehension
4	Define percent slip and speed regulation.	Cognitive	Knowledge
5	Explain how the direction of a three-phase motor is changed.	Cognitive	Comprehension
6	Describe the component parts and operating characteristics of a three-phase wound-rotor induction motor.	Cognitive	Comprehension
7	Describe the component parts and operating characteristics of a three-phase synchronous motor.	Cognitive	Comprehension
8	Describe the design and operating characteristics of various DC motors.	Cognitive	Comprehension

9	Describe the methods for determining various motor connections.	Cognitive	Comprehension
10	Describe general motor protection requirements as delineated in the National Electrical Code® (NEC®).	Cognitive	Comprehension
11	Define the braking requirements for AC and DC motors.	Cognitive	Knowledge
12	Collect data from a motor nameplate.	Psychomotor	Guided Response
13	Identify various types of motors and their application(s).	Psychomotor	Guided Response
14	Connect the terminals for a dual-voltage motor.	Psychomotor	Guided Response

6 Electric Lighting

Order	Description	Learning Domain	Level of Learning
1	Describe the characteristics of light.	Cognitive	Comprehension
2	Recognize the different kinds of lamps and explain the advantages and disadvantages of each type: • Incandescent • Halogen • Fluorescent • High-intensity discharge (HID)	Cognitive	Application
3	Properly select and install various lamps in lighting fixtures.	Psychomotor	Guided Response
4	Recognize and describe the installation requirements for various types of lighting fixtures: • Surface-mounted • Recessed • Suspended • Track-mounted	Cognitive	Comprehension
5	Recognize ballasts and describe their use in fluorescent and HID lighting fixtures.	Cognitive	Comprehension
6	Explain the relationship of Kelvin temperature to the color of light produced by a lamp.	Cognitive	Comprehension
7	Recognize basic occupancy sensors, photoelectric sensors, and timers used to control lighting circuits and describe how each device operates.	Cognitive	Comprehension
8	Read and interpret information given in lamp manufacturers' catalogs for one or more selected lamps.	Cognitive	Application
9	Install one or more of the following lighting fixtures and their associated lamps: • Surface-mounted • Recessed • Suspended • Track-mounted	Psychomotor	Guided Response

7 Conduit Bending

Order	Description	Learning Domain	Level of Learning
1	Describe the process of conduit bending using power tools.	Cognitive	Comprehension
2	Identify all parts of electric and hydraulic benders.	Cognitive	Knowledge

3	Bend offsets, kicks, saddles, segmented, and parallel bends.	Psychomotor	Guided Response
4	Explain the requirements of the National Electrical Code (NEC) for bending conduit.	Cognitive	Comprehension
5	Compute the radius, degrees in bend, developed length, and gain for conduit up to six inches.	Cognitive	Application
6	Use an electric or hydraulic bender to bend a 1" conduit stub-up to an exact distance of 15." above the deck.	Psychomotor	Guided Response
7	Make an offset in a length of conduit to miss a 10" high obstruction with a clearance between the obstruction and the conduit of not less than 1" nor more than 1.".	Psychomotor	Guided Response
8	Make a saddle in a length of conduit to cross an 8" pipe with 1" clearance between the pipe and the conduit.	Psychomotor	Guided Response