

# EET-2910: DIRECTED PRACTICE ELECTRICAL UTILITY TECHNOLOGY III

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## Cuyahoga Community College

### Viewing: EET-2910 : Directed Practice Electrical Utility Technology III

#### Board of Trustees:

2015-06-25

#### Academic Term:

Fall 2018

#### Subject Code

EET - Electrical/Electronic Engineer

#### Course Number:

2910

#### Title:

Directed Practice Electrical Utility Technology III

#### Catalog Description:

Supervised practical applications of electrical overhead line worker job duties in a setting under personal supervision of FirstEnergy personnel. Emphasis on skills required to identify, install, and maintain primary underground residential distribution (URD) equipment, including various methods of troubleshooting URD primary and secondary circuits. Grounding distribution circuits will also be learned. Students will develop the knowledge and skill to safely perform rubber gloving assignments utilizing the insulate and isolate techniques, will perform various tasks while working on an energized three-phase circuit under controlled conditions. Safety topics include: fire extinguisher safety, temporary protective grounds, stored energy devices, and utilities protective service.

#### Credit Hour(s):

4

#### Other Hour(s):

300

#### Other Hour Details:

Directed practice: 20 hours per week at site (300 hours per semester)

Prerequisite(s): EET-1920 Directed Practice Electric Utility Technology II

## Outcomes

#### Course Outcome(s):

Identify, install, and maintain primary underground residential distribution (URD) equipment, including various methods of troubleshooting URD primary and secondary circuits.

#### Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

#### Objective(s):

1. Verbally receive and repeat the switching orders.
2. Install cold shrink outdoor UD terminator
3. Install a terminator on No. 1/0, 35 kv UD cable with jacketed concentric neutral.
4. Install load break terminator
5. Install loadbreak elbow terminator on cable and transformer bushing on a pad-mounted transformer.
6. Install fault indicators on a de-energized section of primary UD cable and a de-energized section of primary OH wire.
7. Conduct a job briefing, isolate, test for potential, and ground any and all conductors that will be proof tested or fault located (thumped).
8. Cut or spike primary with remote cable cutter or UD spiker
9. Follow the step procedures and sever the primary cable from a remote location.
10. Prepare cable for splicing.
11. Troubleshoot radial or loop feed UD circuits (fault indicators)
12. Tag all necessary equipment and report the switching to Regional Dispatcher.

13. Install temporary fault indicators and simulate locating a faulted cable using temporary and permanent fault indicators.
14. Set up a fault wizard and determine if the cable is faulted and determine the location of the fault.
15. Connect a Biddle model 210170 megger leads to the section of UD cable and test the cable and determine if the cable is shorted, open or good.
16. Operate a Hi-Pot fault locator hypotronics.
17. Properly locate a cable path and locate a fault using designated instruments.
18. Properly use instruments to locate a fault on a section of cable that is being fault located (thumped).
19. Proof-test both good and bad cables.
20. Properly isolate, test and ground faulty cables.
21. Correctly demonstrate and explain the use of a transmitter and a signal processor.
22. Troubleshoot cables for proper operation
23. Receive clearance for the section of line.
24. Interpret nameplate and select correct transformers for wiring.
25. Install and make a proper connection for transformer banks.
26. Remove bayonet fuse holder, replace fuse, install new fuse.
27. Install fiberglass pad and single-Phase transformer
28. Install a pad mount transformer onto an existing pad.
29. Make the ground connections, install the primary bushings and secondary connectors.
30. Interpret single line diagrams
31. Define all symbols as shown in the AM/FM Symbology on a one-line diagram.

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**Course Outcome(s):**

Safely perform rubber gloving utilizing the insulate and isolate techniques and perform various tasks while working on an energized three-phase circuit.

**Essential Learning Outcome Mapping:**

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

**Objective(s):**

1. Remove, inspect, and return protective equipment to truck.
2. Explain the Isolate Insulate concepts of Gloving
3. Discuss company safety practices for dealing with direct handling of Isolate Insulate
4. Discuss company work procedures dealing with direct handling (Gloving).
5. Install line hose, blankets, and cover up material (primary)for conductors and equipment based on the specified type of construction from the pole/adjustable platform/bucket truck.
6. Correctly set up and position the bucket truck for working energized conductors.
7. Change pins, insulators and ridge pin on 3-phase bare wire construction following established Isolate and Insulate procedures
8. Replace existing line cutout and re-energize the spur line.
9. Change a blown lightning arrester on the center phase following the isolate insulate procedure.
10. Assemble phasing tools and check phasing of primary conductors, obtain readings of phase to phase and phase to ground.
11. Prepare a load pick-up tool for installation on the conductor
12. Change out cutout on an energized line.
13. Change out a three-phase cross arm with energized primary following the Isolate Insulate procedures.
14. Work from a bucket truck or straddle board to install adequate cover-up. Untie and lay out energized conductors using the isolate insulate concept in conjunction with 2-A.B. Chance extension arms.
15. Install a full-tension sleeve in an energized conductor following the isolate insulate procedures.
16. Work from a bucket truck or adjustable straddle board to double dead-end the conductors using adequate cover up, strap hoists and mechanical jumpers following all Isolate Insulate procedures.
17. Install adequate cover up and replace the primary jumpers as required pole with a 3-phase double dead end.
18. Install a cover up, position vehicle and/or platform in a 3-phase line .
19. Install mechanical jumpers and cut in in-line disconnect switch.
20. Climb a pole, test the circuit for voltage, clean all grounding connection points, install grounds on all phases.
21. Test capacitor units using a capacitance meter.
22. Identify all material needed to construct a capacitor bank.
23. Properly sequence and procedure for installing and removing a capacitor bank from a line, physically and electrically.

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**Methods of Evaluation:**

1. Written Exams
2. Physical performance exams
3. Evaluation by faculty based upon site visitations and written and oral feedback provided by directed practice site supervisors.

**Course Content Outline:**

1. Underground Distribution
  - a. Switch and tag underground distribution
  - b. Re-fuse bayonet fuse holder for pad-mount transformer
  - c. Install fiberglass pad and single-phase transformer
  - d. Install cold shrink outdoor underground terminator
  - e. Install load-break terminator
  - f. Isolate, test, and ground
2. Use and Operation of Tools and Equipment
  - a. Fault Wizard
  - b. Cable cutter or spiker
  - c. Fault indicators
  - d. Hand-cranked megger
  - e. Hi-Pot/Fault Locator-Hypotronics (regional specific training)
  - f. U.D. Fault/Cable Locator-Dynatel 573 A/P (regional specific training)
  - g. U.D. Fault/Cable Locator-Dynatel 4420L (regional specific training)
  - h. Geophone Von Thumpphone II VON-MI-88 (regional specific training)
  - i. U.D. Hi-Pot/Fault Locator-VON-BI-35 (regional specific training)
  - j. Timco Cable Identification System (regional specific training)
  - k. U.D. Fault Locator-Spitfire (regional specific training)
  - l. Cable Insulation Tester (gray box)-(regional specific training)
  - m. Phasing Equipment and DC Hi-Pot Test Adapter
  - n. Load Pick-Up Tool
  - o. Capacitance Meter
3. Interpretation of Single Line Diagrams
4. Installation of Fault Indicators
  - a. Transformer Connections
  - b. Delta-Delta and Delta-Wye (review)
  - c. Wye-Wye (review)
  - d. Wye-Open Delta (review)
  - e. Wye-Delta Closed (review)
5. Gloving
  - a. Isolate and insulate concept
  - b. Safety practices dealing with isolate and insulate concept
  - c. Direct handling
  - d. Installation of line hose, blankets, and cover-up material
6. Safety
  - a. Rubber Protective Equipment
  - b. Switch and Tag Overhead Distribution
  - c. Grounding Distribution Circuits
  - d. Fire Extinguisher Safety
  - e. Temporary Protective Grounds
  - f. Stored Energy Devices
  - g. Utilities Protection Service
  - h. Energized Conductors from a Buck Truck
7. Maintenance
  - a. Change pins, insulators, and ridge pin on 3-phase, bare wire construction
  - b. Replace line cutout
  - c. Replace lighting arrester
  - d. Change out cutout on energized line
  - e. Change out crossarm with energized three-phase primary
  - f. Lay out conductor for re-conductor
  - g. Splice energized conductors
  - h. Cut double dead-end in existing primary
  - i. Replace primary jumpers
  - j. Install in-line disconnect switch on an energized line
  - k. Identify all material needed to construct a capacitor bank

## Resources

Herman, Stephen. *Delmar's Standard Textbook of Electricity*. 5th ed. Clifton Park, NY: Delmar Publishing, 2010.

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Herman, Stephen L. *Alternating Current Fundamentals*. 7th ed. Clifton Park, NY: Delmar Publishing, 2007.

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National Fire Protection Association. *National Electric Code*. 2014 ed. Boston, National Fire Protection Association, 2014.

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## Resources Other

1. Company training materials.

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