

# ISET-2210: COMMERCIAL WIRING

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## Cuyahoga Community College

### Viewing: ISET-2210 : Commercial Wiring

#### Board of Trustees:

2006-05-25

#### Academic Term:

Fall 2018

#### Subject Code

ISET - Integrated Systems Engineering

#### Course Number:

2210

#### Title:

Commercial Wiring

#### Catalog Description:

Principles of commercial electrical installations to prepare for work in the electrical field in a commercial, environmental setting. Based on the National Electric Code, study includes job specifications, sizing and selection of materials, and installation techniques. Extensive guided instruction and practice provided.

#### Credit Hour(s):

3

#### Lecture Hour(s):

2

#### Lab Hour(s):

2

## Requisites

#### Prerequisite and Corequisite

ISET-2240 Applied National Electric Code or concurrent enrollment; or departmental approval.

## Outcomes

#### Course Outcome(s):

A. Install, repair and troubleshoot electrical equipment in a commercial building in accordance with OSHA, NFPA, and ANSI regulations.

#### Objective(s):

1. 1. Apply Lockout, tag-out procedures
2. 10. Determination of circuit loading and wattage per square foot requirements
3. 11. Discuss Fixture installation based on proper placement, support methods, and wiring considerations
4. 12. Locate requirements for over current protection (OCP) for equipment and conductors
5. 13. Determining dynamic characteristics of fuses and circuit breakers
6. 14. Describe common fuse types including: plug, cartridge, single/dual element, time delay, current limiting, fast acting, and classes G, H, J
7. 15. Calculate the short circuit current at the transformer and beyond
8. 16. Explain destructive magnetic forces; withstand rating of the conductors, and insulation under fault conditions regarding OCP
9. 17. Explain the requirements for low voltage and remote control systems (reference Article 725 NEC code)
10. 18. Demonstrate troubleshooting procedures for complete electrical installations
11. 19. Describe raceway installation
12. 2. Identify grounding, overcurrent protection (OCP), and ground fault circuit interrupter (GFCI)
13. 20. Identify different raceways and their applications
14. 21. Employ bending techniques for conduit
15. 22. Apply installation methods for boxes and raceways
16. 3. Identify hazardous locations by Class, Division, Group
17. 4. Define the roles and responsibilities of regulatory agencies in electrical installations.
18. 5. Comply with state / local government requirements for licensing, NEC applications, and electrical permits.

19. 6. Recognize the role the Federal government OSHA, NFPA, ANSI
20. 7. Locate requirements for the selection and installation of fixtures (luminaires).
21. 8. Review Article 250 of NEC(grounding)
22. 9. Identify the basic types of lighting

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**Course Outcome(s):**

B. Interpret symbolism, reading blueprints, working drawings, and sketches for job specifications.

**Objective(s):**

1. 1. Analyze electrical symbols
2. 2. Translate electrical specifications
3. 3. Differentiate between electrical drawings and blueprint types

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**Course Outcome(s):**

C. Compute the electrical load of a commercial building.

**Objective(s):**

1. 1. Calculate number of branch circuits, conductor's ampacity, and circuit OCP
2. 2. Calculate box size, raceway size, and grounding procedure for each branch circuit installation
3. 3. Calculate feeder circuits
4. 4. Calculate service size
5. 5. Calculate motor circuit feeders and overload protection

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**Course Outcome(s):**

D. Install circuitry for switches and receptacles.

**Objective(s):**

1. 1. Selecting correct receptacle for each circuit based on their rating, configuration, and usage
2. 2. Selecting switches based on their rating, configuration and usage
3. 3. Selecting correct wiring configuration and color-coding for each receptacle or switch application

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**Course Outcome(s):**

E. Select and install panel board according to National Electric Code (NEC).

**Objective(s):**

1. 1. Identify operational environment, OCP, rating, and number of circuits for electrical panels
2. 2. Determine the minimum required "working space" around the panel board

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**Course Outcome(s):**

F. Apply proper grounding procedure for electrical circuits.

**Objective(s):**

1. 1. Identify grounding locations
2. 2. Locate and apply grounding requirements according to the NEC

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**Methods of Evaluation:**

1. Completion of homework assignment
2. Written and verbal quizzes covering homework and in class demonstrations
3. Demonstration of application of procedures and methods
4. Final Exam

**Course Content Outline:**

1. CONCEPTS
  - a. OSHA Safety Standards
  - b. Lock-out/Tag-out
  - c. Matter (electrons)
  - d. Ohm's Law

- e. American Wire Gauge (AWG)
  - f. Conductors
  - g. Overcurrent Protection
  - h. Kirkoff Voltage Law (KVL)
  - i. Kirkoff Current Law (KCL)
  - j. AC Basic
  - k. DC Basics
    - l. Principle of ground faults
  - m. Electric motors (AC/DC)
  - n. Transformers
  - o. Meters
  - p. National Electric Code (NEC)
  - q. Grounding (article 250 NEC)
  - r. Flowcharting
  - s. Troubleshooting
  - t. Electric motor nomenclature
  - u. Electric lighting types and applications
  - v. Tooling components
  - w. Fasteners
  - x. Raceways materials and applications
  - y. Measurement systems (U.S. Customary & Metric)
2. SKILLS
- a. Bending conduit
  - b. Installing wire for circuits over 15 amps
  - c. Calculate box size, raceway fill, panel size, feeders, ground, and service size
- 3.
- a. Calculate overcurrent protection size
  - b. Install components of a complete electrical system (raceways, boxes, panels, Switches, receptacle, grounding circuits, and conductors)
  - c. Install lighting fixtures
  - d. Reading instrumentation (meters)
  - e. Troubleshooting (fundamentals)
  - f. Interpret local electrical regulations for installations
  - g. Creating troubleshooting flow charts
  - h. Communication skills
  - i. Estimating
  - j. Safety rule application
  - k. Customer Service
    - l. Interpreting schematics and drawings
  - m. Interpreting National Electric Code (NEC)
  - n. Locating additional resources for materials & troubleshooting
  - o. Interpreting drawings & schematics that are dimensions in U.S customary & metric units.
  - p. Identifying measuring and hand tools for specific jobs.
  - q. Discussing proper fastening techniques.
  - r. Maintenance procedures
4. ISSUES
- a. Networking
  - b. Safe installations
  - c. Design for future growth
  - d. Taking concept and applying it
  - e. Troubleshooting
  - f. Inability to identify problem

## Resources

Mullin, R.C. and Smigh, R. L. *Electrical Wiring Commercial*. 11th ed. Delmar Publishers Inc., 2002.

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Trout, Charles. *Electrical Installation and Inspection*. Thomson Learning, 2002.

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Miller, Charles R. *Illustrated Guide to the National Electric Code*. 2nd ed. Thomson Learning, 2002.

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NFPA. *2002 National Electric Code*. National Fire Protection Association, 2002.

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