MOHAWK VALLEY COMMUNITY COLLEGE

UTICA AND ROME, NEW YORK

COURSE OUTLINE

COMMERCIAL / INDUSTRIAL WIRING AND CODES

ET236

1. CATALOG DESCRIPTION:

ET236 C-2, P-4, Cr-4

This course provides an introduction to electrical wiring techniques with emphasis on design and layout of single and polyphase systems. Topics include diagnosis and repair of equipment malfunctions, interpretation of the National Electrical Code (NEC), estimation of project costs and progress, and installation techniques. Electrical systems studied include lighting, heating, ventilation, interior and exterior power distribution, and emergency energy conservation. Activities are focused on commercial and industrial electrical systems.

Prerequisite: ET102 Technical Electricity 2

TOOLS: Applicable wiring devices and equipment, and personal hand tools

1. STUDENT LEARNING OUTCOMES

Students will be able to:

1. Interpret electrical wiring schematics.
2. Install electrical equipment in accordance with the National Electrical Code.
3. Install and maintain electrical equipment encountered in a variety of commercial-industrial environments.
4. Design, layout, and estimate the cost of electrical systems.
5. Employ the appropriate wiring equipment for different installation/maintenance operations.
6. Display an understanding of electrical trade standards and construction procedures.
7. Display appropriate work ethic during the installation of electrical equipment.
8. DETAILED COURSE OUTLINE

1. Power Distribution

A. Power Generating Equipment

1. Mechanical Power Plants

2. Hydraulic Power Plants

3. Nuclear Power Plants

4. Fossil Fuel Power Plants

5. Local and Remote Control of Power Plants

B. Power Distribution Equipment

1. Power Plant Transformers

2. Switch Yards

3. High Voltage Transmission Lines

4. Power Grid and Substations

5. Local High Voltage Power Distribution Lines

6. Above and Underground Feeder Systems

a. Radial Systems

b. Loop Systems

7. Remote Control of Feeder Systems

8. Pole Sharing

C. Electrical Safety

1. Safety in Proximity to Primary Systems

2. Electric Services

A. Commercial-Industrial Specifications

1. Contract Specifications

2. National Electrical Code and Regulating Agencies

3. Construction Plans, Service Orders

4. Sitework

B. Substations

1. Main disconnect to Unit Substations

2. Unit Substations and Overcurrent Protection

3. Potential and Current Transformers

C. Service Entrances

1. Type of Service

2. High and Low Voltage Services

3. Service Conductors and Raceways

4. Typical Transformer Installations

5. Transformer Connections

6. Service Grounding and Bonding

7. Ground Fault Protection

8. Switchboards, Main Switch

9. Transformer Vaults

10. Grounding Electrodes

11. Metering Equipment

3. Panelboards and Subfeeders

A. Feeder Ducts

1. Feeder Conductors and Cables

2. Feeder Troughs and Trays

3. Feeder Busways and Bus Plugs

4. Trolley Busways

B. Panelboards

1. Power on Distribution Panels

2. Lighting and Appliance Branch Circuit Panelboards

a. Main Breaker or Fuses

b. Number of Circuits

c. Coordination of Protective Devices

4. Branch Circuits

A. Branch Circuit Requirements

1. Current and Voltage Requirements

2. Conductor and Conduit Sizing

3. Appliance Circuits

B. Branch Circuit Installations

1. Conduit

2. Cable

3. Boxes

4. Devices

5. Appliances

6. Luminaries, Lamps and Controls

Mercury Vapor, Sodium

7. Low Voltage Remote Control Lighting Relays

Master Control, Transformers, Wiring Methods

C. Special Systems

1. Surface Metal Raceway

2. Multioutlet Assemblies

3. Floor Boxes and Outlets

5. Special Wiring and Devices

A. Explosion Proof Wiring Systems

1. Classifications of Hazardous Locations

a. Classes I, II and III

b. Two Divisions of Each Class

c. Grouping of Materials According to Minimum

Ignition Energy; Groups A through G Inclusive

d. Applications e.g. Hospital Operating Room

2. Explosion Proof Equipment

a. Containment of Explosion Definition

b. Construction

1. Ground-Joint Construction

2. Threaded-Joint Construction

3. Close Tolerance

4. Sealing Cements

c. Typical Installations

1. Power Circuits

2. Lighting Circuits

3. Flush and Surface Mounting Components

4. Motor Enclosures

d. Fittings

1. Pulling and Junction Unilets

2. Unions, Switches

3. Vertical and Horizontal Sealing Unilets

4. Plugs and Receptacles

5. Lighting Fixtures

6. Motor Starter Unilets

3. OSHA Requirements

1. N.E.C. and OSHA Regulations
2. Recreational
   1. Swimming Pools
   2. Lighting
   3. Grounding Methods

6. Emergency Power Systems

A. Dual Service Entrances

B. Transfer Switches

C. Auxiliary Power Generators

1. Natural Gas Driven

2. Gasoline and Diesel Driven

3. Power Ratings

4. Uninterruptable Power Supplies

a. Transistor Switching

7. Communications

A. Sound Systems

1. Intercom System and System Remote Control

2. Public Address System

3. FM, AM and Transceiver Antennas

4. Paging Systems

5. Telephone System

B. Signal Systems

1. Smoke, Heat and Fire Detection Alarm System
   1. Sensors
      1. Heat
      2. Rate of Rise Heat Detector
      3. Smoke Detectors
      4. Recommended Locations
   2. Supervisory Circuits
   3. Alarms and Controls

8. Equipment and Tools

A. Hand Tools for Commercial-Industrial Wiring

1. Hand Benders

2. Hickey for Rigid Conduit

3. Machine Benders (hand operated)

a. Multipurpose Hydraulic Bender

b. One-Shot Benders

4. Cable Cutters, Cable Strippers

5. Augers, Bit Extensions

6. Hacksaw, Flexsaw

7. Knockout Punch

8. Chisels, Nail Pullers

9. Pin and Stud Setter

10. Conduit Threader, Pipe Cutter

11. Crimping Tool (Buchanan)

B. Power Tools

1. Pipe Pusher

2. Anchor Pin Firing Gun

3. Open-yoke Power Connector Compressor

4. Machine Conduit Bender-Motor Driven

5. Power Threader

6. Hydraulic Knockout Punch

7. Power Wire Puller

8. Vacuum Fishing Tools

C. Equipment

1. Portable Conduit Rack

2. Wire Dispenser

1. DETAILED PRACTICUM OUTLINE
2. Wiring of switches and receptacles—Chapt. 5 in "Commercial" Book
3. Transformers and different connections
4. Delta to Delta Transformers—"Phasing the transformers"
5. 3-Phase "unbalanced" lines
6. 3-Phase "unbalanced" lines—"Delta to Delta"
7. 3-Phase "balanced" lines—"Delta to Delta"
8. "Open" Delta and "Open" Wye transformers
9. 3-Phase "balanced" lines—"3-Phase 4-Wire Wye"
10. 3-Phase "Half-Wave" Rectification—"3-Phase, 4-Wire Wye" & 3-Phase - 3 Pulse Rectifier
11. 3-Phase "Bridge Rectifier"—3-Phase, 4-Wire Wye & 3-Phase, 6 Pulse Rectifier
12. Wiring within the Industrial Plant using 2 ea. 3-phase transformers and 1 ea. single phase transformer.
13. Wiring a 3-phase sub-station to a 3-phase transformer in a commercial building vault room
14. POTENTIAL COURSE ASSIGNMENTS

Assessments will vary depending on instructor; however, homework, laboratory reports, quizzes, projects, and exams will be commonly utilized.