

SOUTHEAST COMMUNITY COLLEGE
CONSTRUCTION MANUFACTURING AND TECHNOLOGY DIVISION
Electrician Construction Program
Revision Date: November 21, 2024

I. CATALOG DESCRIPTION

Course Number: ELET1722
Course Title: AC Theory III, Haz. Loc. & Fire Alarm
Prerequisite(s): ELET1717
Corequisite(s): None
Catalog Description: The theory of Alternating Current (AC) circuits are studied further and multiple exercises are complete to reinforce the concepts. A review and use of the various test instruments. Hazardous Locations is covered in detail along with the articles in the NEC that deal with those classified areas. The concepts of fire alarm systems and the devices used in conjunction with them is covered. Several hands-on fire alarm labs accompany this training.

Credit Hours: 4
Class Hours: 45
Lab Hours: 45
Total Contact Hours: 90

II. COURSE OBJECTIVES: *Course will:*

- A. Continue to build upon what was learned in course ELET1717 as well as introduce new concepts and work processes.
- B. Explain power factor, generators and introduce them to 3-phase systems.
- C. Illustrate concepts of hazardous locations and the articles in the NEC that cover these classified areas.
- D. Demonstrate the basic principles of a fire alarm system and the different types of devices connected to those systems.

III. STUDENT LEARNING OUTCOMES AND GENERAL EDUCATION LEARNING OUTCOMES:

- A. Student Learning Outcomes: *Student will be able to:*
 - 1. Discuss the concepts of Power Factor and its effects on an electrical system.
 - 2. Recognize the ways in which to correct power factor.
 - 3. Demonstrate how to use test instruments to determine power factor with 100% accuracy.
 - 4. Demonstrate the use of a power quality test meter.
 - 5. Identify the concepts of hazardous locations.
 - 6. Locate the different hazardous location classes within the NEC.
 - 7. Discuss the fundamentals of a fire alarm system.
 - 8. Demonstrate how to connect initiating fire alarm devices with 100% accuracy.
 - 9. Demonstrate how to connect notification fire alarm devices with 100% accuracy.
 - 10. Demonstrate how to connect devices to a fire alarm signal line circuit.
 - 11. Demonstrate the connections of a 3-phase Wye and Delta transformer.
 - 12. Demonstrate how to make connections on a 3-phase Wye type transformer with 100% accuracy.
- B. General Education Learning Outcomes (GELOs)
 - 1. GELO #5: Analytical, Quantitative, and Scientific Reasoning

Outcome 3: Effectively develop strategies, algorithms, or experiments (or performing experiments) to better describe the systems or to solve the problems.

IV. CONTENT/TOPICAL OUTLINE

A. SECTION 1

1. Power Factor
2. Power Factor Correction
3. General Use Test Instruments
4. Electronic Circuit Test Instruments
5. Introduction to Generators
6. Understanding How the DC Generator Works
7. Understanding the Design and Function of AC Generators
8. An Introduction to 3-Phase Systems

B. SECTION 2

1. Voice-data-video (VDV) test instruments
2. Power quality test instruments
3. High voltage and insulation test instruments
4. Instrumentation and process control test instruments
5. Special maintenance test instruments
6. Troubleshooting

C. SECTION 3

1. Hazardous (classified) locations concepts
2. Article 500 – understanding class I, II, and III locations
3. The requirements for electrical installations in class I locations
4. The requirement for electrical installations in class II locations
5. The requirements for wiring in class III locations and intrinsically safe systems
6. Article 505 – Zone 0, 1, and 2 locations
7. Article 506 – Zone 20, 21, and 22 locations for combustible dusts or ignitable fibers/flyings
8. Specific locations – Article 511 through 516
9. Hazardous locations applications

D. SECTION 4

1. Review and introduction to blueprints
2. Industrial Specifications
3. Industrial Prints I
4. Industrial Prints II
5. Industrial Prints III
6. Electrical system design and upgrade considerations

E. SECTION 5

1. Introduction to fire alarm systems
2. Fundamentals and system requirements
3. Initiating devices
4. Notification appliances
5. Wiring and wiring methods
6. System interfaces and safety control functions
7. Emergency communication systems & emergency voice/alarm communication systems
8. Plans and specifications
9. Advanced detection topics
10. Public emergency alarm reporting systems and supervising stations
11. Single-and multi-station alarm and household fire alarm systems

- 12. Inspection, testing and maintenance
- F. SECTION 6
 - 1. Transformers: magnetism and electromagnetism
 - 2. Transformers operation principles
 - 3. Transformer connections
 - 4. Real world transformer connections
 - 5. Harmonics
 - 6. Power Generation and distribution

V. INSTRUCTIONAL MATERIALS

- A. Required Text(s):
 - 1. *Applied Grounding & Bonding Textbook -2023 Edition – NJATC*
 - 2. *Commercial Blueprint Sets- NJATC*
 - 3. *Effective Leadership Skills Textbook –NJATC*
 - 4. *Fire Alarm Systems Textbook – NJATC*
 - 5. *Instrumentation SW Kit Complete – NJATC (Kit includes: Fundamentals of Instrumentation 2 ed.-NJATC)*
- B. Textbooks from previous required classes:
 - 1. *Transformer Principles and Applications Textbook –NJATC*
 - 2. *Electrical Safety Related Work Practices – NJATC*
 - 3. *Blueprint Reading for Electricians Textbook– NJATC*
 - 4. *NFPA 70 National Electrical Code -2023 Edition, Textbook-NJATC*
 - 5. *Test Instruments Textbook- NJATC*
 - 6. *Test Instruments Applications Manual- NJATC*
 - 7. *Ugly's Electrical References Book -2023 Edition – NJATC*
 - 8. *AC Theory -NJATC*
- C. Other Resources: Instructor handouts, National Electric Code (NFPA 70 NEC-2023 Edition) and References available at the Lincoln Electrical Joint Apprenticeship and Training Committee Training Center.

VI. METHODS OF PRESENTATION/INSTRUCTION

- A. Methods of presentation typically include a combination of the following:
 - 1. Lecture
 - 2. Discussions
 - 3. Demonstration

VII. METHODS OF EVALUATION

- A. Methods of evaluation typically include a combination of the following:
 - 1. Quizzes
 - 2. Tests and Exams

VIII. SPECIFIC COURSE REQUIREMENTS

- A. The students will maintain an average of 80% (B) or more on the quizzes, tests and exams or the IBEW can drop them from the program.