

## AIR 134 – Circuits and Controls I

Revised: Fall 2026

### Course Description

Presents circuit diagrams for air conditioning units, reading and drawing of circuit diagrams, types of electrical controls. Includes analysis of air conditioning circuits, components, analysis and characteristics of circuits and controls, testing and servicing. Introduces electricity for air conditioning which includes circuit elements, direct current circuits and motors, single and three-phase circuits and motors, power distribution systems, and protective devices. Studies the electron and its behavior in passive and active circuits and components. Demonstrates electronic components and circuits as applied to air conditioning system. Part I of II.

Prerequisite:

Credit Hours: 4      Lecture: 3 hours      Lab: 3 hours      Total: 6 hours per week

### Course Objectives (Core Competencies)

- ☒ **Civic Engagement** is the ability to contribute to the civic life and well-being of local, national, and global communities as both as social responsibility and a life-long process. Degree graduates will demonstrate the knowledge and civic values necessary to become informed and contributing participants in a democratic society.
- ☒ **Critical Thinking** is the ability to use information, ideas, and arguments from relevant perspectives to make sense of complex issues and solve problems. Degree graduates will locate, evaluate, interpret, and combine information to reach well-reasoned conclusions and solutions.
- ☒ **Professional Readiness** is the ability to work well with others and display situationally and culturally appropriate demeanor and behavior. Degree graduates will demonstrate skills important for successful transition into the workplace and pursuit of further education.
- ☒ **Quantitative Literacy** is the ability to perform accurate calculations, interpret quantitative information, apply and analyze relevant numerical data, and use results to support conclusions. Degree graduates will calculate, interpret, and use numerical and quantitative information in a variety of settings.
- ☒ **Scientific Literacy** is the ability to apply the scientific method and related concepts and principles to make informed decisions and engage with issues

related to the natural, physical, and social world. Degree graduates will recognize and know how to use the scientific method, and to evaluate empirical information.

- ☒ **Written Communication** is the ability to develop, convey, and exchange ideas in writing, as appropriate to a given context and audience. Degree graduates will express themselves effectively in a variety of written forms.

### **Course Learning Outcomes**

After completion of this course, students will be able to:

Upon successful completion of this course, students will be able to interpret, draw, and analyze electrical circuit diagrams for air conditioning systems; identify and explain the function of electrical controls, circuit elements, motors, and protective devices; apply principles of direct current and single- and three-phase alternating current circuits to HVAC equipment; evaluate the behavior of electrons in passive and active components; and demonstrate proficiency in testing, servicing, and troubleshooting electrical and electronic circuits as applied to refrigeration, heating, and air conditioning systems.

### **Major Topics to be Included**

Throughout the course, the instructor will present material on but not limited to:

1. Introduction to Electricity for Air Conditioning
  - Atomic theory, the electron, and behavior in passive and active components
  - Basic circuit elements: resistance, capacitance, inductance
2. Direct Current (DC) Circuits
  - Laws of electrical circuits (Ohm's Law, Kirchhoff's Laws)
  - Series, parallel, and combination DC circuits
  - Measurement and analysis of DC circuits
3. Alternating Current (AC) Circuits
  - Single-phase and three-phase AC circuits and motors
  - Power distribution systems and power factor
  - Transformers and protective devices
4. Circuit Diagrams and Electrical Controls
  - Reading and interpreting air conditioning circuit diagrams
  - Drawing wiring and schematic diagrams
  - Types of electrical controls and their applications

## 5. Air Conditioning Circuits and Components

- Analysis of common HVAC electrical components (contactors, relays, capacitors, overloads, thermostats, etc.)
- Characteristics and functions of circuits and controls
- Servicing and troubleshooting of HVAC electrical systems

## 6. Electronic Components and Circuits in HVAC Applications

- Solid-state devices and control boards
- Application of electronic circuits in modern HVAC systems

## 7. Practical Applications and Laboratory Work

- Circuit construction and measurement
- Testing and servicing of HVAC electrical circuits
- Troubleshooting exercises using actual or simulated HVAC equipment

## **Assessment Types Used in the Course**

- Quizzes and Homework Assignments – covering textbook chapters (1–17) and lecture material.
- Lab Reports and Practical Exercises – demonstrating circuit construction, measurement, and troubleshooting skills.
- Midterm and Final Exams – written assessments testing conceptual understanding and problem-solving.
- Practical Skills Test (Hands-On Exam) – evaluating student ability to analyze, test, and service HVAC electrical circuits.
- Class Participation and Discussion – active engagement in lecture and lab activities.