

APPT 154: RF 202 ELECTRIC CONTROLS FUNDAMENTALS

Foothill College Course Outline of Record

Heading	Value
Units:	4.5
Hours:	30 lecture, 78 laboratory per quarter (108 total per quarter)
Prerequisite:	Per California Code of Regulations, this course is limited to students admitted to the Air Conditioning & Refrigeration Technology Apprenticeship Program.
Advisory:	Not open to students with credit in APPR 134.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	None
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

Student Learning Outcomes

- A student will be able to demonstrate proper use of electrical meters.
- A student will be able to construct ladder diagrams.
- A student will be able to interpret sequence of operation from ladder diagrams.

Description

Fundamentals of electrical controls related to HVAC and refrigeration equipment. Students will assemble and wire actual electrical components and controls.

Course Objectives

The student will be able to:

- Identify the essentials of an automatically controlled system.
- Describe the fundamentals of measurement.
- Describe the various types of control systems and their applications.
- Describe types of control action and auxiliary control equipment.
- Demonstrate the ability to interpret and construct electrical diagrams and circuits.
- Demonstrate the use of electrical testing meters.
- Describe purpose and application of motor controllers.
- Describe the construction and application of thermostats.

Course Content

- Identify the essentials of an automatically controlled system
 - Controller
 - Controlled device
 - Control medium
 - The process, or mechanical system
- Describe the fundamentals of measurement
 - Pressure measurement
 - Temperature measurement
 - Relative humidity measurement

- Sensing devices
- Describe the various types of control systems and their applications
 - Electric
 - Electronic
 - Pneumatic
 - Hydraulic
 - Combination systems
- Describe types of control action and auxiliary control equipment
 - Two position action
 - Floating action
 - Proportional action
 - Switches and switch action
 - Variable resistors
 - Transformers
 - Relays
- Demonstrate the ability to interpret and construct electrical diagrams and circuits
 - Installation and connection diagrams
 - Schematic and ladder diagrams
 - Fusing of control circuits
 - Arrangements of control circuits
- Demonstrate the use of electrical testing meters
 - Electrical safety
 - Ammeter and multimeter (VOM/DMM)
 - Testing and troubleshooting electrical circuits and components
- Describe purpose and application of motor controllers
 - Starting inertia and torque load
 - Reduced voltage and current starters
 - Capacitors and single phase motors
 - Magnetic starters
- Describe the construction and application of thermostats
 - Room and wall thermostats, duct thermostats
 - Remote bulb thermostats
 - Changeover thermostats
 - Thermostat calibration

Lab Content

Students will work individually and in teams on assembling electrical components and wiring control circuits.

Special Facilities and/or Equipment

- Personal protective equipment
- Laboratory with electrical components

Method(s) of Evaluation

- Results of written quizzes and final examination
- Satisfactory completion of hands-on projects
- Maintenance of a student's workbook with questions drawn from text

Method(s) of Instruction

- Lecture
- Lab Assignment
- Group Discussion
- Demonstration

Representative Text(s) and Other Materials

Smith, Russell E. Electricity for Refrigeration, Heating and Air Conditioning. 9th ed. Stamford, CT: Cengage Learning, 2015.

Smith, Russell E. Lab Manual: Electricity for Refrigeration, Heating and Air Conditioning. 9th ed. Stamford, CT: Cengage Learning, 2015.

Auvil, Ronnie J. HVAC and Refrigeration Systems Training Manual. Orland Park, IL: American Technical Publishers, 2014.

NOTE: We will adopt the next edition of each text, as it is published.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

A. Readings from textbook

B. Writing assignments given in the laboratory

1. Make a ladder type wiring diagram for a typical packaged heating and cooling unit
2. Describe the sequence of operation of each component in the circuit

Discipline(s)

Air Conditioning, Refrigeration, Heating