

APPT 155: RF 301 ADVANCED ELECTRIC CONTROLS

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 140.
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 differentiate between digital and analog control systems.
- A student will be able to describe the function of motor starters.
- A student will be able to describe the operation of VFDs.

Description

Advanced principles of electric controls used for mechanical equipment in the HVAC industry. Study control diagrams and further develop skills and service procedures used to troubleshoot electrical problems in HVACR equipment.

Course Objectives

The student will be able to:

- Describe function and installation of thermostats and actuators for two position controllers and for modulating control.
- Describe and identify humidity, pressure and miscellaneous controls.
- Describe valve and damper control applications.
- Explain primary source and secondary temperature control principles.
- Control refrigeration machinery and water piping systems.
- Describe combustion control applications.
- Perform service procedures used to troubleshoot HVACR equipment components and electrical control circuits.

Course Content

- Describe operation of thermostats and actuators for two position controllers and for modulating control
 - Bimetal and bellows thermostats, multi-stage thermostats
 - Two wire unidirectional actuator motor, two position and spring return
 - Three wire two position actuators
 - Actuator position feedback principles
 - Floating control and proportional actuators
- Describe and identify humidity, pressure and miscellaneous controls

- Dry bulb temperature/wet bulb temperature
- Humidistat
- Dual pressure control and oil pressure failure control
- Static pressure control, time clocks, pressure switch, flow switch
- Step controller/microprocessor controller
- Describe valve and damper control applications
 - Automatic control valves/mixing valves/diverting valves
 - Solenoid valves
 - Parallel operation and opposed operation dampers
 - Mixing dampers and face and bypass dampers
 - Damper linkage adjustment
- Explain primary source and secondary temperature control principles
 - Primary source equipment/distribution equipment/terminal equipment
 - Zone control
 - Secondary control methods applied to distribution systems and terminal units
- Control refrigeration machinery and water piping systems
 - Reciprocating compressor diagrams and controls
 - Control of centrifugal water chillers
 - Chilled water and hot water piping control systems
 - Reheat systems
- Describe combustion control applications
 - Operating controls, sensors and limit controls
 - Gas valves and pressure regulators
 - Thermocouple and flame guard systems
- Perform service procedures used to troubleshoot HVACR equipment components and electrical control circuits
 - Electrical safety review
 - Component fault isolation checks
 - Inductive load and switching device measurements
 - Electric motor/compressor checks and electrical measurements
 - Assemble complex electrical power and control circuits with components

Lab Content

Students will work individually and in teams on using correct service procedures to solve electrical problems.

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. Draw a schematic wiring diagram for a floating control system
2. Describe the function and operation of each component in the circuit

Discipline(s)

Air Conditioning, Refrigeration, Heating