

# APPT 159: RF 501 START, TEST & BALANCE; HVAC SYSTEMS

## Foothill College Course Outline of Record

Heading	Value
<b>Effective Term:</b>	Summer 2024
<b>Units:</b>	7
<b>Hours:</b>	72 lecture, 36 laboratory per quarter (108 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Air Conditioning & Refrigeration Technology Apprenticeship Program.
<b>Advisory:</b>	Not open to students with credit in APPR 149A.
<b>Degree &amp; Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

## Student Learning Outcomes

- A student will be able to describe the commissioning process.
- A student will be able to list special tools needed for start-up.
- A student will be able to define job specific submittals.

## Description

Use of balancing instruments and devices for HVACR systems. Covers theory and operation of mechanical systems, equipment, and testing instruments. This course stresses the necessity of comprehending the design and intent of the mechanical project, the proper use of testing apparatus, and the production of professional reports.

## Course Objectives

The student will be able to:

1. Perform testing, balancing, and adjusting procedures on HVACR systems and components
2. Explain properties of air and the use of psychometric charts
3. Describe air distribution systems and accessories
4. Start-up and perform initial test of air handling systems
5. Balance air distribution systems
6. Describe start-up and balancing procedures for hydronic systems

## Course Content

1. Perform testing, balancing, and adjusting procedures on HVACR systems and components
  - a. Procedures for testing pressure and temperature
  - b. Procedures for balancing air handling system and water pumping systems

- c. Procedures for adjusting control equipment and devices
  - d. Start, test, and balance reports
  - e. Commissioning
2. Explain properties of air and the use of psychometric charts
    - a. Properties of air
    - b. Dry-bulb temperature, wet-bulb temperature, Dew point temperature, relative humidity
    - c. Sensible heat, latent heat, and the enthalpy of air
    - d. Humidity measuring devices
    - e. How a psychometric chart is read and used in working with air conditioning systems
  3. Describe air distribution systems and accessories
    - a. Dampers, grilles, and diffusers
    - b. Terminal units
    - c. Velocity control/static pressure
    - d. Fans: types and theory
  4. Start-up and perform initial test of air handling systems
    - a. Applications of instruments for measuring air velocities
    - b. Plans/specifications/equipment data
    - c. Initial fan checks
    - d. Spot checks of air distribution
    - e. Fan speed adjustment/adjusting sheaves, pulleys, and belts
  5. Balance air distribution systems
    - a. Measuring air velocities at outlets and terminal units
    - b. Process of adjusting air flow
    - c. Multizone units and variable air volume systems
  6. Describe start-up and balancing procedures for hydronic systems
    - a. Applications of pressure and flow measuring devices
    - b. Differential pressure gauges/annular flow indicator
    - c. Calibrated balancing valves
    - d. Centrifugal pumps: types and theory

## Lab Content

Students will work individually and in teams on measuring and testing air handling and hydronic systems.

## Special Facilities and/or Equipment

1. Laboratory with HVACR testing instruments
2. When taught via Foothill Global Access, on-going access to computer with email software and hardware; email address

## Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

Results of written quizzes and final exam  
Results of projects and class participation  
Workbook of student's daily activities

## Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Lecture  
Lab assignment  
Group discussion

Demonstration

## **Representative Text(s) and Other Materials**

International Pipe Trades Joint Training Committee. Start, Test & Balance. 2018.

Although this textbook is older than 5 years, it conforms to national training standards and is considered seminal in the discipline. We will adopt the next edition, as it is published.

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

1. Weekly readings from textbook:
  - a. Example: read chapter 3, "Properties of Air and The Psychometric Chart," answer study questions using psychometric chart
2. Writing assignments given in the laboratory:
  - a. Create Excel spreadsheet and record required test data measurements needed for start-up of an air handling system
  - b. Write a start-up report for an air conditioning system

## **Discipline(s)**

Air Conditioning, Refrigeration, Heating