

APPT 178: START, TEST & BALANCE II

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2024
Units:	4.5
Hours:	36 lecture, 66 laboratory per quarter (102 total per quarter)
Prerequisite:	Per California Code of Regulations, this course is limited to students admitted to the Refrigeration & Air Conditioning Mechanical Service Apprenticeship Program.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	None
Grade Type:	Letter Grade Only
Repeatability:	Not Repeatable

Student Learning Outcomes

- A student will be able to apply fluid balance laws.
- A student will be able to demonstrate pumps and pump laws.

Description

Fourth-year course of the Refrigeration and Air Conditioning Apprenticeship program. This course provides students with a working knowledge of start, test and balance for piping systems, pumps, chillers, boilers, and condensers. Students will learn how to audit mechanical equipment to ensure proper energy efficiency techniques are applied.

Course Objectives

The student will be able to:

1. Explain fluid flow
2. Recognize, classify, and explain piping systems and sizing
3. Recognize pumps and explain pumps laws
4. Explain applications and components
5. Benchmark building mechanical equipment

Course Content

1. Fluid flow
 - a. Fluid properties
 - b. Fluid dynamics
2. Piping systems
 - a. 1-pipe systems, direct return
 - b. 2-pipe systems, reverse return
 - c. 3-pipe systems, primary secondary
 - d. 4-pipe systems, series loop
 - e. Pipe sizing ITT size chart
3. Pumps and pump laws
 - a. Pumping systems
 - b. Control valves

4. Applications and components
 - a. Chillers/boilers
 - b. Condensers open, closed water and air
 - c. Heat pumps
 - d. Towers
 - e. Other components
5. Mechanical equipment
 - a. Building mechanical equipment from drawings
 - b. Benchmarking mechanical equipment

Lab Content

Students will work individually and in teams in the lab, which includes:

1. Calibration and balancing of 1-piping to a 4-piping system
2. Controlled study: heat transfer equipment and steam service
3. Refrigeration and cooling related to hydronics
4. Measuring efficiency of mechanical equipment

Special Facilities and/or Equipment

1. Laboratory with calibration and balancing tools
2. Personal protective equipment
3. 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:

Written examination
 Hands-on demonstration
 Chapter quizzes
 Group and classroom participation
 Punctuality

Method(s) of Instruction

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

Lecture
 Discussion
 Laboratory
 Demonstration

Representative Text(s) and Other Materials

United Association of Journeymen and Apprentices. [Start, Test and Balance](#). 2018.

Texts older than five years that may be utilized in this course are industry-standard texts.

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

1. Readings from the course textbook
 - a. Steam systems and how they relate to hydronics
 - b. The application of condensate and return
 - c. Boiler and chiller safety callouts
2. Writing assignment involves class assignments to prepare diagrams of 1-piping, 2-piping, 3-piping, and 4-piping systems

Discipline(s)

Air Conditioning, Refrigeration, Heating