

# APSM 158B: PNEUMATIC CONTROLS FOR HVAC SYSTEMS

## Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2022
Units:	2.5
Hours:	30 lecture, 10 laboratory per quarter (40 total per quarter)
Prerequisite:	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
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 successful student will be able to differentiate between reverse acting and direct acting pneumatic controls.
- A successful student will be able to identify the interface between electric and pneumatic controls.

## Description

Students apply theory using components of a pneumatic control system to develop a sound understanding of a pneumatic control system operation.

## Course Objectives

The student will be able to:

1. Identify the components of a pneumatic central air station and explain the operation of these components
2. Identify controls commonly used on a pneumatic VAV system and explain their operation
3. Assemble a basic pneumatic control system
4. Maintain, troubleshoot, calibrate and repair a pneumatic control system
5. Understand interfaces between pneumatic and electronic controls

## Course Content

1. Identify the components of a pneumatic central air station and explain the operation of these components
  - a. Pneumatic central air stations (Lec and Lab)
  - b. Demonstrate knowledge of common compressors, filters, dryers, regulators, separators (Lec and Lab)
  - c. Demonstrate proper air compressor and air station maintenance procedures (Lec and Lab)

- d. Demonstrate knowledge causes of common air compressor failures (Lec and Lab)
  - e. Demonstrate knowledge of checking and adjusting compressor controls (Lec and Lab)
2. Identify controls commonly used on a pneumatic VAV system and explain their operation
    - a. Common controls on a pneumatic VAV (Lec and Lab)
    - b. Demonstrate the operation and differences of various velocity controllers (Lec and Lab)
    - c. Demonstrate ability to determine spring ranges of commonly controlled pneumatic devices and explain how these differences impact calibration (Lec and Lab)
    - d. Demonstrate the differences between reverse and direct-acting thermostats (Lec and Lab)
  3. Assemble a basic pneumatic control system
    - a. Assemble a basic pneumatic control system (Lec and Lab)
    - b. Demonstrate the ability to diagram, select proper components and assemble a pneumatic control system (Lec and Lab)
  4. Maintain, troubleshoot, calibrate and repair a pneumatic control system
    - a. Perform maintenance troubleshooting calibration and repair of a pneumatic controls system (Lec and Lab)
    - b. Demonstrate the ability to maintain, calibrate and troubleshoot common pneumatic devices, such as averaging relays, reversing relays, thermostats (Lec and Lab)
    - c. Demonstrate the knowledge and impact of spring-pressure and spring range shift on a pneumatic VAV control system (Lec and Lab)
    - d. Demonstrate the ability to install, configure and adjust common velocity controllers (Lec and Lab)
  5. Understand interfaces between pneumatic and electronic controls
    - a. Interfaces between pneumatic and electronic controls (Lec and Lab)
    - b. Demonstrate operation, component selection, installation, calibration of pneumatic electronic interfaces (Lec and Lab)
    - c. Demonstrate the ability to troubleshoot pneumatic/electronic interfaces (Lec and Lab)

## Lab Content

1. Assemble, test and calibrate a pneumatic control loop

## Special Facilities and/or Equipment

1. Laboratory with sheet metal service 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:

- Results of written quizzes and tests
- Responses in class discussions
- Comprehensive written final examination
- Comprehensive final project
- Demonstration of assigned skills to acceptable level per instructor

## Method(s) of Instruction

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

Lecture  
Discussion  
Demonstration  
Lab assignments followed by discussion

## Representative Text(s) and Other Materials

Whitman, B., B. Johnson, J. Tomczyk, and E. Silberstein. Refrigeration and Air Conditioning Technology, 8th ed.. 2016.

Auvil, Ronnie J.. HVAC Controls Systems, 4th ed.. 2017.

These are the standard sheet metal textbooks/workbooks used for this course. Although one or more may not be within five years of the required published date, they are the most current books used when teaching this course.

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

1. Sample reading assignment: From the Refrigeration and Air Conditioning Technology textbook, Unit 16, portions 16.3, 16.4, and 16.5, regarding pneumatic controls
2. Sample writing assignment: Answer review questions related to assigned reading

## Discipline(s)

Sheet Metal or Air Conditioning, Refrigeration, Heating