

# APSM 177B: ADVANCED DDC CONTROLS/COMMISSIONING OF HVAC SYSTEMS

## Foothill College Course Outline of Record

Heading	Value
<b>Units:</b>	2
<b>Hours:</b>	24 lecture, 16 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<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 successful student will be able to write a sample HVAC control loop program and successfully demonstrate its use on a simulator board.
- A successful student will be able to describe the three levels of commissioning according to SMACNA.

## Description

Students will install, program and calibrate direct digital control components on HVAC systems. Students will describe the SMACNA commissioning process and prepare sample functional performance tests.

## Course Objectives

The student will be able to:

- Describe an HVAC control loop and identify the required components
- Properly assemble the components for an HVAC control loop
- Write a sample HVAC control loop program and successfully demonstrate its use on a simulator board
- Properly calibrate a DDC VAV controller and  $\Delta P$  sensor
- Describe the HVAC commissioning roles and responsibilities
- Describe the three levels of commissioning according to SMACNA
- Describe the use and purpose of commissioning forms and commissioning log
- Write a sample functional performance test
- Discuss available industry resources

## Course Content

- Describe an HVAC control loop and identify the required components
  - Describe the required components in an HVAC control loop (Lec)
  - Identify the function of each component in an HVAC control loop (Lec)
- Properly assemble the components for an HVAC control loop
  - Properly assemble and wire the required devices to complete a functioning control loop (Lab)

- Write a sample HVAC control loop program and successfully demonstrate its use on a simulator board
  - Write a control program for the assembled control loop (Lec and Lab)
  - Upload the control program for the assembled control loop and demonstrate its proper functioning (Lec and Lab)
- Properly calibrate a DDC VAV controller and  $\Delta P$  sensor
  - Properly calibrate the airflow sensor on a DDC VAV controller (Lec and Lab)
  - Properly calibrate the  $\Delta P$  sensor on a DDC HVAC system (Lec and Lab)
- Describe the HVAC commissioning roles and responsibilities
  - Describe the role and responsibilities of the commissioning authority, design professional, commissioning agent and field technician (Lec)
  - Describe the purpose of HVAC commissioning (Lec)
- Describe the three levels of commissioning according to SMACNA
  - Describe and differentiate Level 1 through Level 3 commissioning per SMACNA (Lec)
- Describe the use and purpose of commissioning forms and commissioning log
  - Describe and complete a sample commissioning test form for an HVAC system (Lec and Lab)
  - Create and complete a commissioning log for a sample project (Lec and Lab)
- Write a sample functional performance test
  - Write a sample functional performance test procedure for a roof top AC unit (Lec and Lab)
  - Complete a functional performance test using the completed test procedure (Lec and Lab)
- Discuss available industry resources
  - Discuss other available industry organizations and resources for commissioning and retro commissioning (Lec)

## Lab Content

- Properly assemble and wire the required devices to complete a functioning control loop.
- Properly calibrate the airflow sensor on a DDC VAV controller.

## Special Facilities and/or Equipment

- Laboratory with sheet metal test and balance tools and sample system components
- Personal protective equipment

## Method(s) of Evaluation

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

## Method(s) of Instruction

- Lecture
- Discussion
- Demonstration
- Lab assignments followed by discussion

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

Sheet Metal and Air Conditioning Contractors National Association, Inc. [HVAC Systems Commissioning Manual](#). 2nd ed. Chantilly, VA: SMACNA, 2013.

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

A. Sample reading assignment: From the textbook, units on HVAC commissioning.

B. Sample writing assignments:

1. Describe and complete a sample commissioning test form for an HVAC system.
2. Write a sample functional performance test procedure for a roof top AC unit.

## **Discipline(s)**

Sheet Metal