

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

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2022
Units:	2
Hours:	24 lecture, 16 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 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 ΔP 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 ΔP sensor
 - Properly calibrate the airflow sensor on a DDC VAV controller (Lec and Lab)
 - Properly calibrate the ΔP 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
- 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
Demonstration of assigned skills to acceptable level per instructor
Comprehensive final project

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

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

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

- a. Sample reading assignment: From the [HVAC Systems Commissioning Manual](#) textbook, units on HVAC commissioning
- b. Sample writing assignments:
 - i. Describe and complete a sample commissioning test form for an HVAC system
 - ii. Write a sample functional performance test procedure for a roof top AC unit

Discipline(s)

Sheet Metal