

APSM 180A: BUILDING AUTOMATION & CONTROLS 1

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2023
Units:	2
Hours:	18 lecture, 22 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 Only
Repeatability:	Not Repeatable

Description

Students will gain an overview of building automation and controls used in HVAC systems. Students will develop an understanding of the electronic controls within a control system as they apply to building automation controls in a HVAC system.

Course Objectives

The student will be able to:

1. Explain the operation of an electronic control system
2. List the advantages semiconductors have over vacuum tubes
3. Describe the function and operation of common types of diodes
4. Describe the function and operation of common types of transistors
5. Describe the function and operation of common types of thyristors
6. Describe the function and operation of integrated circuits
7. Identify common considerations for troubleshooting semiconductor devices
8. List common applications of electronic control systems

Course Content

1. Explain the operation of an electronic control system
 - a. Describe that an electronic control system is a control system in which the power supply is 24 VDC or less
2. List the advantages semiconductors have over vacuum tubes
 - a. Describe how a vacuum tube is a device that switches or amplifies electronic signals and that vacuum tubes perform these functions by allowing electrons to flow to plates that are located inside a glass tube
3. Describe the function and operation of common types of diodes
 - a. Explain how a diode is a semiconductor device that allows current to flow in one direction only
4. Describe the function and operation of common types of transistors
 - a. Show how a transistor is a three-terminal semiconductor device that controls current according to the amount of voltage applied to the base

5. Describe the function and operation of common types of thyristors
 - a. Explain how a thyristor is a solid-state switching device that switches current ON by a quick pulse of control current
6. Describe the function and operation of integrated circuits
 - a. Describe how an integrated circuit is an electronic device in which all components (transistors, diodes, and resistors) are contained in a single package or chip
7. Identify common considerations for troubleshooting semiconductor devices
 - a. Explain how the most common electronic circuit troubleshooting situation is to find the correct printed circuit (PC) board, determine if the board has a problem, and replace the board if necessary
8. List common applications of electronic control systems
 - a. Describe how electronic control system components include sensors and electronic thermostats that are used in applications such as multi-zone unit control, boiler control, and chiller control

Lab Content

Students will build an operational electronic control panel.

Special Facilities and/or Equipment

1. Laboratory with sheet metal service tools and sample system components
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 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

International Training Institute for the Sheet Metal and Air Conditioning Industry. [Electrical Theory](#). 2017.

International Training Institute for the Sheet Metal and Air Conditioning Industry. [Testing, Adjusting and Balancing](#). 2017.

Auvil, Ronnie J.. [HVAC Control Systems](#). 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 textbook, read assigned sections on DDC [controls](#)
2. Sample writing assignment: Compose a list of electronic components and their function in the building control system

Discipline(s)

Sheet Metal