

APSM 174A: HYDRONIC SYSTEMS, PUMPS & HYDRONIC BALANCING

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 describe a bourdon tube gauge and differential pressure gauge.
- A successful student will be able to define the characteristics and determine pump impeller diameter, bhp, and estimated flow, from a pump curve.

Description

Students will gain an overview of the components and design of hydronic systems used in HVAC. Students will be able to measure pressures and determine flow through a pump and across various hydronic components.

Course Objectives

The student will be able to:

1. Define the components of a hydronic system
2. Describe piping arrangements in a hydronic system
3. Identify common styles of valves used in HVAC hydronic systems and their applications
4. Identify common symbols used in HVAC drawings
5. Identify a bourdon tube gauge and differential pressure gauge
6. Describe PSI, PSIG, PSIA
7. Determine flow from various hydronic devices
8. Define cavitation in a pump
9. Determine pump operating pressures
10. Define the characteristics and determine pump impeller diameter, BHP and estimated flow from a pump curve
11. Use the pump laws to determine flow, pressure and horsepower
12. Identify the parts of a centrifugal pump

Course Content

1. Define the components of a hydronic system
 - a. Define and identify the energy conversion unit, heat exchanger, prime mover, conductor, control and metering valves and auxiliary devices in a hydronic system (Lec)
2. Describe piping arrangements in a hydronic system
 - a. Describe the flow and control arrangements in a piping system (Lec)
3. Identify common styles of valves used in HVAC hydronic systems and their applications
 - a. Describe the uses of valves in a piping system (Lec)
 - b. Identify and describe the application of common valves in a hydronic system (Lec)
4. Identify common symbols used in HVAC drawings
 - a. Identify common hydronic symbols used in HVAC drawings (Lec)
5. Identify a bourdon tube gauge and differential pressure gauge (Lec and Lab)
6. Describe PSI, PSIG, PSIA
 - a. Determine pressures in a hydronic system using different gauges (Lab)
7. Determine flow from various hydronic devices (Lab)
 - a. Determine flow through a Venturi (Lab)
 - b. Determine flow through a CBV and auto flow device (Lab)
 - c. Determine flow through a coil or valve using CV (Lab)
8. Define cavitation in a pump
 - a. Describe two types of cavitation in a pump (Lec)
9. Determine pump operating pressures (Lab)
 - a. Determine block tight pump suction pressure and discharge pressure (Lab)
 - b. Determine pump operating suction pressure and discharge pressure (Lab)
10. Define the characteristics and determine pump impeller diameter, BHP and estimated flow from a pump curve (Lec and Lab)
 - a. Describe the characteristics of a pump curve (Lec)
 - b. Determine pump impeller diameter, BHP and estimated flow from a pump curve
11. Use the pump laws to determine flow, pressure and horsepower (Lec)
12. Identify the parts of a centrifugal pump (Lec)

Lab Content

1. Determine block tight pump suction pressure and discharge pressure
2. Define and determine PSIA and atmospheric absolute pressure

Special Facilities and/or Equipment

1. Laboratory with sheet metal test and balance 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 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

International Training Institute for the Sheet Metal and Air Conditioning Industry. Testing, Adjusting & Balancing of Environment Systems. 2003.

This is the standard sheet metal textbook/workbook used for this course. Although it may not be within five years of the required published date, it is the most current book 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, pages on hydronic systems
2. Sample writing assignment: Use pump laws to determine flow, pressure, and horsepower

Discipline(s)

Sheet Metal