APSM 153C: COMPONENTS OF THE REFRIGERANT CYCLE

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 use pressure and temperature measuring instruments to evaluate refrigerant condition in a typical hvac system.
- A successful student will be able to use charging equipment to achieve the desired refrigerant charge for a common air conditioning system.

Description

Students learn the theory and components of the refrigerant cycle, as used to transfer heat.

Course Objectives

The student will be able to:

1. Explain functions of evaporators
2. Explain functions of condensers
3. Explain functions of compressors
4. Explain functions of expansion devices
5. Explain functions of special components: filter driers, sight glass, suction line accumulator, liquid line receiver, hot gas bypass, ambient controls

Course Content

1. Evaporators
    a. Define high, medium and low temperature refrigeration (Lec and Lab)
    b. Determine the boiling temperature in an evaporator (Lec and Lab)
    c. Identify the different types of evaporators (Lec and Lab)
    d. Describe a parallel flow, plate and fin evaporator (Lec and Lab)
    e. Describe multiple and single circuit evaporators (Lec and Lab)
2. Condensers
    a. Explain the purpose of the condenser in a refrigerant cycle (Lec and Lab)
    b. Describe the differences between the operating characteristics of water cooled and air cooled systems (Lec and Lab)
    c. Describe the basics of heat exchange in a condenser (Lec and Lab)
    d. Explain the differences between the different types of water cooled condensers (Lec and Lab)
    e. Describe a wastewater system (Lec and Lab)
    f. Describe a recirculating system (Lec and Lab)
    g. Describe a cooling tower (Lec and Lab)
    h. Describe the operation of head pressure controls (Lec and Lab)
3. Compressors
    a. Explain the function of the compressor in a refrigeration system (Lec and Lab)
    b. Discuss compression ratio (Lec and Lab)
    c. Describe four different methods of compression (Lec and Lab)
    d. State specific conditions under which a compressor is expected to operate (Lec and Lab)
    e. Explain the difference between a hermetic and a semi hermetic compressor (Lec and Lab)
    f. Describe the various working parts of reciprocating and rotary compressors (Lec and Lab)
4. Expansion devices
    a. Describe the three most popular types of expansion devices (Lec and Lab)
    b. Describe the operating characteristics of the three most popular expansion devices (Lec and Lab)
    c. Describe how the three expansion devices respond to load changes (Lec and Lab)
    d. Describe the operation of a balanced port expansion valve (Lec and Lab)
    e. Describe the operation of a dual port expansion valve (Lec and Lab)
    f. Describe how electronic expansion valves and their controllers work (Lec and Lab)
5. Special components: filter driers, sight glass, suction line accumulator, liquid line receiver, hot gas bypass, ambient controls
    a. Distinguish between mechanical and electrical controls (Lec and Lab)
    b. Explain how and why mechanical controls work (Lec and Lab)
    c. Describe an automatic pump down system (Lec and Lab)
    d. Define low ambient operation (Lec and Lab)
    e. Describe electrical controls that apply to refrigeration (Lec and Lab)
    f. Describe off cycle defrost (Lec and Lab)
    g. Describe the various refrigeration accessories (Lec and Lab)
    h. Describe random and planned defrost (Lec and Lab)
    i. Explain temperature terminated defrost (Lec and Lab)
    j. Describe the low side components (Lec and Lab)
    k. Describe the high side components (Lec and Lab)

Lab Content

1. Observe and assess lab demonstrations of various components and systems

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
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, Units 21, 22, 23, 24 and 25, "Evaporators, Condensers, Compressors, Expansion Devices and Special Components"
2. Sample writing assignment: Answer review questions related to assigned reading

Discipline(s)

Sheet Metal or Air Conditioning, Refrigeration, Heating