APSM 154A: REFRIGERATION IN AIR CONDITIONING

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2022
Units:	2
Hours:	20 lecture, 20 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 calculate the standard operating discharge pressures at various ambient conditions.
- A successful student will be able to describe the steps in performing a compressor change out for a HVAC refrigerant system.

Description

Students apply the refrigerant cycle theory to its use in an HVAC system and investigate the functions of individual components in these systems.

Course Objectives

The student will be able to:

1. Understand refrigeration as applied to air conditioning systems
2. Understand and describe typical operating conditions of an air conditioning system
3. Describe the function and operation of electrical controls for an air conditioning system
4. Perform a compressor change out
5. Troubleshoot air conditioning refrigerant cycle
6. Troubleshoot compressor operation

Course Content

1. Understand refrigeration as applied to air conditioning systems
   a. Explain three ways in which heat transfers into a structure (Lec)
   b. State two ways that air is conditioned for cooling (Lec)
   c. Explain refrigeration as applied to air conditioning (Lec)
2. Typical operating conditions of an air conditioning system
   a. Calculate the correct operating suction pressures for both standard and high efficiency air conditioning equipment under various operating conditions (Lec and Lab)
   b. Calculate the standard operating discharge pressures at various ambient conditions (Lec and Lab)
   c. Explain how "high efficiency" is accomplished (Lec and Lab)
   d. Describe package air conditioning equipment (Lec and Lab)
   e. Describe split system equipment (Lec and Lab)
3. Electrical controls for an air conditioning system
   a. Describe the control sequence of an air conditioning system (Lec and Lab)
   b. Explain the function of the 24 volt control voltage (Lec and Lab)
   c. Describe the space thermostat (Lec and Lab)
   d. Describe the compressor contactor (Lec and Lab)
   e. Explain the operation of the high and low pressure controls (Lec and Lab)
   f. Discuss the function of the overloads and the motor winding thermostat (Lec and Lab)
   g. Discuss the winding thermostat and the internal relief valve (Lec and Lab)
   h. Identify operating and safety controls (Lec and Lab)
   i. Compare modern and older control concepts (Lec and Lab)
   j. Describe how crankcase heat is applied in some modern equipment (Lec and Lab)
4. Perform a compressor change out
   a. Perform diagnostic on a compressor (Lec and Lab)
   b. Describe the steps in performing a compressor change out (Lec and Lab)
   c. Perform change out of a compressor (Lec and Lab)
5. Troubleshoot air conditioning refrigerant cycle
   a. Select the correct instruments for checking an air conditioning unit with a mechanical problem (Lec and Lab)
   b. Select the correct instruments for troubleshooting electrical problems in an air conditioning system (Lec and Lab)
   c. Check the line and low voltage power supplies, troubleshooting basic electrical problems in an air conditioning system (Lec and Lab)
   d. Use an ohmmeter to check the various components of an electrical system
6. Troubleshoot compressor operation (Lec and Lab)

Lab Content

1. Perform diagnostic checks on a refrigerant compressor
2. Perform change out of an HVAC refrigerant compressor

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
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

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, Unit 36, "Refrigeration as applied to Air Conditioning"
2. Sample writing assignment: Answer review questions related to assigned reading

Discipline(s)

Sheet Metal or Air Conditioning, Refrigeration, Heating