Heat Pumps (HART 2449)

Credit: 4 semester credit hours (2 hours lecture, 6 hours lab)

Prerequisite/Co-requisite: HART 1407 or HART 1441

Course Description

A study of heat pumps, heat pump control circuits, defrost controls, auxiliary heat, air flow, and other topics related to heat pump systems.

Required Textbook and Materials

1. Electricity for Refrigeration, Heating and Air Conditioning by Russell E. Smith, 9th edition.
    a. ISBN number is 10: 1-285-17998-6
2. Modern Refrigeration and Air Conditioning by Althouse, Turnquist, and Bracciano, 19TH edition.
    a. ISBN number is 978-1-61960-199-4

Course Objectives

Upon completion of this course, the student will be able to:

1. Identify a reverse cycle system.
2. List the mechanical and electrical components for the heat pump operation.
3. Identify the operation of heat pump modes including cooling, heating, defrost, emergency heat, and auxiliary heat mode.
4. Identify and explain different methods of accomplishing defrost.
5. Perform charging a system correctly in the heating and cooling modes.

   Troubleshoot electrical and mechanical components.
6. Perform tests for adequate air flow.
7. Calculate balance point and C.O.P. (co-efficiency of performance)

Course Outline

A. Introduction
    1. Introduction of faculty and students
    2. Review Syllabus
    3. Review Class Policies
    4. Review Lab Assignments
B. Review of Basic HVAC Systems
    1. Refrigeration Theory
    2. Electrical Theory
C. Electrical Components Unique to Air-to-Air Heat Pumps
    1. Reversing Valves
    2. Defrost Sensors & Relays
    3. Auxiliary & Emergency Heaters
D. Heat Pump Thermostats & Wiring
    1. Multi-Stage Terminals
    2. Reversing Valve Terminals
    3. Additional Control Circuits

E. Charging Heat Pumps
   1. Super Heat and Subcool Method
   2. Manufacturer Charging Charts
   3. Weigh-in Charge
F. System Efficiency
   1. SEER
   2. COP
G. Geothermal Heat Pump Systems
   1. Explore Principles of Geothermal
   2. Explain Heat Transfer through Coaxial Heat Exchangers
   3. Identify different Loop Designs
   4. Perform Polyethylene Loop Fusion

Grade Scale

A = 90 - 100

B = 80 - 89

C = 70 - 79

D = 60 - 69

F = 0 - 59

Course Evaluation

1. 4 Objective Test 25%
2. Lab Projects/test 25%
3. Comprehensive Final 25%
4. Homework 25%

Course Requirements

1. Homework assignments
2. Hands on lab activities
3. Complete comprehensive final
4. Certificate students are required to take ESCO HVAC Excellence Test.

Student should take HVAC Excellence Exam.

Course Policies

1. There will be *no* horseplay tolerated.
2. No open foot shoes, sandals, or flip-flops: closed foot shoes *only*.
3. No smoking, eating, or sleeping will be tolerated during class.
4. If an assignment is late, there will be 5 points deducted per day.
5. No hanging jewelry or rings in lab.

Disabilities Statement

The Americans with Disabilities Act of 1992 and Section 504 of the Rehabilitation Act of 1973 are federal anti-discrimination statutes that provide comprehensive civil rights for persons with disabilities. Among other things, these statutes require that all students with

documented disabilities be guaranteed a learning environment that provides for reasonable accommodations for their disabilities. If you believe you have a disability requiring an accommodation, please contact the Special Populations Coordinator at (409) 880-1737 or visit the office in Student Services, Cecil Beeson Building.

Student Code of Conduct Statement

It is the responsibility of all registered Lamar Institute of Technology students to access, read, understand and abide by all published policies, regulations, and procedures listed in the *LIT Catalog and Student Handbook*. The *LIT Catalog and Student Handbook* may be accessed at www.lit.edu or obtained in print upon request at the Student Services Office. Please note that the online version of the *LIT Catalog and Student Handbook* supersedes all other versions of the same document.

Course Schedule

Week	Topic	Reference
1	Introduction & Safety Orientation	Lecturer Notes & Hand-Outs
2	Principles & Theory of Basic Refrigeration & Heat Pump Systems	Lecturer Notes
3	Refrigeration Components unique to air-to-air Heat Pumps	Chapter 24
4	Electrical Components unique to air-to-air Heat Pumps	Chapter 24
5	Identify & Troubleshoot Heat Pump Components	Lab Procedure
6	Heat Pump Thermostats, Wiring & Controls for both Heating and Cooling Cycle	Hand-Outs
7	Demonstrate & Troubleshoot Heat Pump Thermostats, Wiring & Controls	Lab Procedure
8	Charging Heat Pumps by Super Heat and Subcool Method	Lecturer Notes & Hand-Outs
9	Demonstrate Charging Heat Pumps by Super Heat and Subcool Method	Lab Procedure
10	Charging Heat Pumps by Manufacturer Charging Charts and Weight Method	Lecturer Notes & Hand-Outs
11	Demonstrate Charging Heat Pumps by use of Charging Charts and Weight Method	Lab Procedure
12	Calculate Coefficiency of Performance & Introduction to Geothermal Heat Pump Systems	Chapter 16
13	Principles & Theory of Geothermal Heat Pump Systems	Chapter 24, Lecturer Notes
14	Identify & Demonstrate Loop Fusion	Hand-Outs & Lab Procedure
15	Review for Final Exam	Lecturer Notes

16	Final Exam	

Contact Information:

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