Heat Pumps (HART 2449)

CREDIT

4 Semester Credit Hours (2 hours lecture, 6 hours lab)

MODE OF INSTRUCTION
Hybrid

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

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. **HYBRID course requirements** includes watching Online digital videos, completing homework assignments, quizzes, and virtual lab simulations by due dates assigned through Interplay Learning - Skillmill.

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

INSTRUCTOR CONTACT INFORMATION

Instructor:	Royace Hill
Email:	rrhill@lit.edu
Office Phone:	(409)257-0068
Office Location:	Tommy Williams Building ITC 2 Room 101
Office Hours:	5-530PM Mondays & Wednesdays

REQUIRED TEXTBOOK AND MATERIALS

SKILLMILL Online digital learning resource provided by Lamar Institute of Technology.

Modern Refrigeration and Air Conditioning textbook by Althouse, Turnquist, and Bracciano, either of the two latest editions

Approved: DG/8.26.2024

HART 2449
Course Syllabus

ATTENDANCE POLICY
Absences totaling no more than 20% of class meetings

DROP POLICY
If you wish to drop a course, you are responsible for initiating and completing the drop process. If you stop coming to class and fail to drop the course, you will earn an "F" in the course.

COURSE CALENDAR (DATES ARE SUBJECT TO CHANGE)

DATE	TOPIC	READINGS (Due on this Date)	ASSIGNMENTS (Due on this Date)
10.21.2024	**MODULE 1** -COURSE INTRODUCTION & SAFETY	**Bb→CONTENT→MODULE (1) folder** DUE 11.3.2024	SKILLMILL → START HERE with DUE 11.3.2024
	MODULE 1 - EXAM		**EXAM 11.4.2024**
11.4.2024	**MODULE 2** -INTRO TO REFRIGERATION SYSTEMS -TEMPERATURE PRESSURE & HEAT -BASIC HVAC TOOLS -EVAPORATORS & CONDENSERS -METERING DEVICES -COMPRESSORS	**Bb→CONTENT→MODULE (2) folder** DUE 11.17.2024	SKILLMILL → HART 1401 With DUE 11.17.2024
	MODULE 2 - EXAM		**EXAM 11.18.2024**
11.18.2024	**MODULE 3** -LEAK CHECK & EVACUATION -CHARGING Pt. 1 – TOOLS & RULES -CHARGING Pt. 2 – SUBCOOLING & SUPER HEAT -HVAC SUPPLIES	**Bb→CONTENT→MODULE (3) folder** DUE 11.24.2024	SKILLMILL → HART 1403 Continued with DUE 11.24.2024
	MODULE 3 - EXAM		**EXAM 11.25.2024**
11.25.2024	**MODULE 4** - INTRO TO HEAT PUMPS - INTRO TO CHILLERS	**Bb→CONTENT→MODULE (4) folder** DUE 12.1.2024	SKILLMILL → HART 1451 Continued with

	- HEAT PUMPS TROUBLESHOOTING		DUE 12.1.2024
	MODULE 4 - EXAM		**EXAM 12.4.2024**
	SPECIAL PROJECT		**DUE 12.4.2024**

****ADDITIONAL HAND-OUTS MAYBE GIVEN AND DUE DATE WILL BE ASSIGNED IN CLASS.****

COURSE EVALUATION

Final grades will be calculated according to the following criteria:

- SPECIAL PROJECT 5%
- HOMEWORK/ASSIGNMENTS (KC) 20%
- QUIZZES (FKC) 10%
- EXAMS 25%
- LAB/PROJECTS 40%

GRADE SCALE

A= 90-100
B= 80-89
C=70-79
D=60-69
F= 0-59

TECHNICAL REQUIREMENTS

The latest technical requirements, including hardware, compatible browsers, operating systems, etc. can be online at https://lit.edu/online-learning/online-learning-minimum-computer-requirements. A functional broadband internet connection, such as DSL, cable, or WiFi is necessary to maximize the use of online technology and resources.

DISABILITIES STATEMENT

The Americans with Disabilities Act of 1990 and Section 504 of the Rehabilitation Act of 1973 are federal anti-discrimination statutes that provide comprehensive civil rights for persons with disabilities. LIT provides reasonable accommodations as defined in the Rehabilitation Act of 1973, Section 504 and the Americans with Disabilities Act of 1990, to students with a diagnosed disability. The Special Populations Office is located in the Eagles' Nest Room 129 and helps foster a supportive and inclusive educational environment by maintaining partnerships with

faculty and staff, as well as promoting awareness among all members of the Lamar Institute of Technology community. If you believe you have a disability requiring an accommodation, please contact the Special Populations Coordinator at (409)-951-5708 or email specialpopulations@lit.edu. You may also visit the online resource at Special Populations - Lamar Institute of Technology (lit.edu).

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. Please note that the online version of the *LIT Catalog and Student Handbook* supersedes all other versions of the same document.

ARTIFICIAL INTELLIGENCE STATEMENT

Lamar Institute of Technology (LIT) recognizes the recent advances in Artificial Intelligence (AI), such as ChatGPT, have changed the landscape of many career disciplines and will impact many students in and out of the classroom. To prepare students for their selected careers, LIT desires to guide students in the ethical use of these technologies and incorporate AI into classroom instruction and assignments appropriately. Appropriate use of these technologies is at the discretion of the instructor. Students are reminded that all submitted work must be their own original work unless otherwise specified. Students should contact their instructor with any questions as to the acceptable use of AI/ChatGPT in their courses

STARFISH

LIT utilizes an early alert system called Starfish. Throughout the semester, you may receive emails from Starfish regarding your course grades, attendance, or academic performance. Faculty members record student attendance, raise flags and kudos to express concern or give praise, and you can make an appointment with faculty and staff all through the Starfish home page. You can also login to Blackboard or MyLIT and click on the Starfish link to view academic alerts and detailed information. It is the responsibility of the student to pay attention to these emails and information in Starfish and consider taking the recommended actions. Starfish is used to help you be a successful student at LIT.

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ADDITIONAL COURSE POLICIES/INFORMATION

HART 2449
Course Syllabus

Course Requirements

1. Homework assignments
2. Hands on lab activities
3. Use of Blackboard and other Web based platforms and resources
4. It is require to complete a safety policy form

Course Policies

1. No horse playing tolerated, always maintain a safe learning environment.
2. No open foot shoes, sandals, or flip-flops: closed foot shoes *only*.
3. No smoking, eating, or sleeping will be tolerated during class; LIT is a tobacco free campus
4. No rings or other jewelry and lanyards worn exterior that can be a lab hazard.
5. No unauthorized use of cell phones and computers during class.
6. Safety glasses or goggles and gloves are required while working in the lab
7. No make-up for missed exams; but lowest written exam score will be dropped from final grade
8. Due dates are *final*, acceptance of late work will be instructor's discretion
9. Two times tardy will result in an absence; always notify the instructor for excused absences
10. Executed completion of the HVAC Safety Policy and Procedure Form required before working in Lab.
11. Instructor will reply to student's emails within 2 business days.