MIDLAND COLLEGE
SYLLABUS
HART 2449
HEAT PUMPS
3-3

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. This course covers specialized refrigeration systems such as heat pumps, cascade systems, chill water systems, and gas absorption systems. The student will learn the distinctive type controls and equipment necessary for these systems. **Prerequisites: HART 1401 and HART 1407 or consent of instructor.**

Text, References, and Supplies:

1. **REFRIGERATION AND AIR CONDITIONING TECHNOLOGY**, Whitman and Johnson. Current Edition.
2. **REFRIGERATION AND AIR CONDITIONING TECHNOLOGY LAB MANUAL**, Whitman and Johnson.
3. Industry Literature

Course Goals/Objectives:

This course is designed to train the serviceperson on the more advanced and unusual type equipment in the HVAC industry. Heavy emphasis is placed on heat pump operation and service. The following list of course goals will be addressed in the course. These goals are directly related to the performance. Upon successful completion of the course the student will: (* designates a CRUCIAL Goal)

1. Display *work habits*.
2. Identify heat pump *components*.
3. Explain heat pump *cooling operation*.
4. Explain heat pump *heating operation*.
5. Define heat pump *terms*.
6. Describe heat pump *cycle*.
7. List heat pump *components.*
8. Compare heat pump *metering devices*.
9. Explain *sub-cooling valve*.
10. Examine *accumulator function*.

11. Examine *air to air* heat pump systems.
12. Examine *check valve* operation.
13. Examine heat pump *heat mode* piping design.
14. Examine heat pump *cooling mode* piping design.
15. Inspect heat pump *components*.
16. Explain *scroll compressor operation*.
17. Examine *solar assisted* heat pump systems.
18. Examine *water to air* heat pump systems.
19. Analyze *fixed bore metering device* operation.
20. Analyze *reversing* valve operation.
21. Analyze *sub-cooling* valve operation.
22. Determine *defrost initiation* type.
23. Determine *defrost termination* type.
24. Analyze heat pump *defrost systems*.
25. Describe defrost *relay function*.
26. Identify defrost *controllers.*
27. Troubleshoot *defrost circuits.*
28. Determine *outdoor thermostat* purpose.
29. Determine *watt restrictor* purpose.
30. Describe heat pump *system types*.
31. Trace *auxiliary* heat control circuit.
32. Trace *emergency* heat control circuit.
33. Analyze heat pump *control circuits.*
34. *Troubleshoot* control circuits.
35. Compare heat pump *thermostats*.
36. Define *balance point*.
37. Calculate heat pump *efficiency.*
38. Calculate heat pump *system balance point*.
39. Define refrigerant *recovery terms*.
40. Determine heat pump *refrigerant charge*.
41. Determine heat pump *air handler CFM*.
42. Compare heat pump *charging methods*.
43. Examine *absorption systems*.
44. Compare absorption system *efficiency.*
45. Determine absorption system *refrigerant.*
46. Explain absorption system *operation.*
47. Identify absorption system *components*.
48. Examine *single stage* centrifugal systems.
49. Examine *two stage* centrifugal systems.
50. Compare centrifugal system *refrigerants.*
51. Explain *centrifugal system operation.*
52. Identify *centrifugal system components*.

53. Explain *cascade system operation.*
54. Identify *cascade system components.*
55. Trace *primary* cascade refrigerant circuit.
56. Trace *secondary* cascade refrigerant circuit.
57. Compare *cascade system refrigerants*.
58. Trace cascade *heating circuit*.
59. Trace *electrical circuit*.
60. Draw *electrical diagram*.

Student Contributions and Class Policies:

Each student will spend at least 4 hours per week preparing for class. As a student in this course you are expected to display respect, professional behavior, and cooperative attitude at all times. Punctual attendance is critical in this class due to the extent of the material. The college attendance policy will be strictly adhered to. The student is expected to be prepared to work and to participate in all class activities.

Evaluation of Students:

Lab	30%
Quizzes and Homework	25%
Attitude and Attendance	20%
Final Exam	25%
Total	100%

Course Schedule:

The class meets for 6 lecture hours and 6 lab hours per week for 8 weeks

SCANS Information:

The following SCANS skills will be taught and/or reinforced in this course.

WRITING:
Communicates thoughts, ideas, information, and messages in writing; records information completely, and accurately; creates graphs, reports and charts.

LISTENING/SPEAKING:
Receives, attends to, interprets, and responds to verbal messages. Communicates oral messages, participates in discussions, and group activities.

THINKING SKILLS:
Recognizes problems and devises and implements plan of action. Uses efficient learning techniques to acquire and apply new knowledge and skills.

PERSONAL QUALITIES:
Displays responsibility, self-esteem, sociability, self management, integrity, and honesty. Chooses ethical courses of action.

Safety Glasses Policy:

It is required that all persons in the Air Conditioning Program wear eye protection while in the lab. Students are required to furnish their own protection. Visitors will be supplied with a pair of glasses to be used during their visit. If you have any questions about this policy, please ask your instructor to clarify them for you.

Instructor Information:

Jaroy Roberts, Instructor
Room 187 TC
(432) 685-4687 Office
(432) 349-5913 cell
E-Mail: jroberts@midland.edu
Office Hours: Posted

Curt Pervier, Applied Technology Dean
Lisa Hays, Applied Technology Secretary
Room 143A
(432) 685-4676
Fax: (432)685-6472

Students are encouraged to contact the instructor at any time; however, making an appointment will guarantee the instructor's availability at a specific time.

Americans with Disabilities Act (ADA) Statement:

Midland College provides services for students with disabilities through Student Services. In order to receive accommodations, students must visit www.midland.edu/accommodation and complete the Application for Accommodation Services located under the Apply for Accommodations tab. Services or accommodations are not automatic, each student must apply and be approved to receive them. All documentation submitted will be reviewed and a "Notice of Accommodations" letter will be sent to instructors outlining any reasonable accommodations.

*Students MUST actively participate by completing an academic assignment required by the instructor by the official census date. Students who so not actively participate in an academically-related activity will be reported as never attended and dropped from course.

Midland College Non-Discriminatory Statement:

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the non-discrimination policies: **Tana Baker, Title IX Coordinator/Compliance Officer, 3600 N. Garfield, SSC 242, Midland, TX 79705, (432) 685-4781, tbaker@midland.edu; Natasha Morgan, Director Human Resources/Payroll, 3600 N. Garfield, PAD 104, Midland, TX 79705, (432) 685-4534, nmorgan@midland.edu.** For further information on notice of non-discrimination, visit **http://wdcrobcolp01.ed.gov/CFAPPS/OCR/contactus.cfm** or call **1 (800) 421-3481**.

Spanish

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