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:
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.
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.
22. Determine defrost initiation type.
23. Determine defrost termination type.
25. Describe defrost relay function.
26. Identify defrost controllers.
27. Troubleshoot defrost circuits.
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:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab</td>
<td>30%</td>
</tr>
<tr>
<td>Quizzes and Homework</td>
<td>25%</td>
</tr>
<tr>
<td>Attitude and Attendance</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>25%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

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.

Students with Disabilities

Midland College provides services for students with disabilities through Student Services. In order to receive accommodations, students must place documentation on file with the Counselor/Disability Specialist. Students with disabilities should notify Midland College prior to the beginning of each semester. Student Services will provide each student with a letter outlining any reasonable accommodations. The student must present the letter to the instructor at the beginning of the semester.

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