



Technical College of the Lowcountry
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ACR 210 HEAT PUMPS

Course Description

This course is study of the theory of operational principles of the heat pump. This course will cover the heat pump and its mechanical and electrical devices, coil design and airflow characteristics. Also covered are the proper operation, servicing, troubleshooting and repair.
4 Cr (4 lect/pres, 0 lab, 0 other)

Course Focus

The instructor will instruct the theory of operation of the heat pump. The instructor will teach the proper way to service, troubleshoot, repair and install a heat pump.

Text and References

Refrigeration and Air Conditioning Technology 7th. edition, Whitman, Tomczyk, Johnson & Silberstein. Refrigeration and Air Conditioning Technology Lab Manual, 7th. edition, Whitman, Tomczk, Johnson & Silberstein. Publisher: Delmar Cengage Learning, Clifton Park, NY.

Book: Published 2012, ISBN: 1111644470

Lab Manual published: 2012, ISBN: 1111644489

Course Goals

The following list of course goals will be addressed in the course. These goals are directly related to the performance objectives. (*designates a CRUCIAL goal)

1. characterize heat pump areas
2. explain package heat pump
3. describe heat pumps
4. identify piping material
5. name heat sources
6. define balance point
7. establish outdoor unit location

8. change air filter
9. calculate coefficient of performance
10. verify refrigerant line size
11. check supply air temperature
12. classify metering devices
13. classify refrigerant compressors
14. examine liquid line driers
15. figure auxiliary heat
16. find suction line
17. identify refrigerant lines
18. list heat pump components
19. recognize reversing valve
20. sketch reversing valve
21. specify discharge line
22. clean refrigerant coils
23. do preventive maintenance
24. operate cooling mode
25. operate heating mode
26. perform function test
27. perform subcooling test
28. read charging chart
29. read refrigerant line temperature
30. service heat pump
31. activate defrost cycle
32. balance refrigerant charge
33. check electrical connections
34. decontaminate refrigerant system
35. find refrigerant leak
36. diagnose defective txv
37. label control terminals
38. perform standing leak test
39. set heat anticipator
40. evaluate capacitor values
41. verify resistance of coils
42. demonstrate system pumpdown
43. obtain motor winding resistance
44. read electrical schematic
45. replace fan motor
46. replace indoor fan motor
47. replace outdoor fan motor
48. install compressor hard start
49. change compressor contactor
50. describe geothermal heat pump
51. classify geothermal heat pumps
52. define geothermal wells
53. describe dry well
54. recognize closed loop
55. recognize open loop

56. clarify water quality
57. draw ground loop configurations
58. backflush closed loop
59. bleed closed loop
60. understand counterflowing heat exchangers

Student Contributions

Each student must complete all reading and written assignments.

In addition, chapter tests are to be completed as assigned.

Students will also complete a final exam/project to demonstrate their knowledge of the material.

The student will not be allowed in the lab with any type of open toe shoe. (flip flops etc.)

No cell phones are allowed to be used in the classroom or lab. This includes texting.

No recording of classes is allowed.

The student must have all required books by the second class of the semester. No copies of any books or manuals are allowed.

The student is expected to be in class on time.

Course Evaluation

There will be an open book exam at the end of each chapter. There will be a closed book final exam. There will be a heat pump performance test using manufacturer's information. The closed book exam is worth a maximum of 10 points. The final exam is worth a maximum of 50 points. The performance test is worth a maximum of 40 points.

Course Schedule

The class meets for 4 lecture/presentation hours per week.

Approved by: *Kenneth Flick* Developed/Revised: 1/7/2013
Ken Flick, Division Dean for Business/Industrial Technology

ADA Statement

The Technical College of the Lowcountry provides access, equal opportunity and reasonable accommodation in its services, programs, activities, education and employment for individuals with disabilities. To request disability accommodation, contact the counselor for students with disabilities at (843) 525-8228 during the first ten business days of the academic term.

Academic Misconduct

There is no tolerance at TCL for academic dishonesty and misconduct. The College expects all students to conduct themselves with dignity and to maintain high standards of responsible citizenship.

It is the student's responsibility to address any questions regarding what might constitute academic misconduct to the course instructor for further clarification.

The College adheres to the Student Code for the South Carolina Technical College System. Copies of the Student Code and Grievance Procedure are provided in the *TCL Student Handbook*, the Division Office, and the Learning Resources Center.

Attendance

The College's statement of policy indicates that students must attend ninety percent of total class hours or they will be in violation of the attendance policy.

- Students not physically attending class during the first ten calendar days from the start of the semester must be dropped from the class for NOT ATTENDING. Reinstatement requires the signature of the division dean.
- Students taking an online/internet class must sign in **and** communicate with the instructor within the first ten calendar days from the start of the semester to indicate attendance in the class. Students not attending class during the first ten calendar days from the start of the semester must be dropped from the class for NOT ATTENDING. Reinstatement requires the signature of the division dean.
- In the event it becomes necessary for a student to withdraw from the course **OR if a student stops attending class, it is the student's responsibility to initiate and complete the necessary paperwork.** Withdrawing from class may have consequences associated with financial aid and time to completion.
- When a student exceeds the allowed absences, the student is in violation of the attendance policy. The instructor **MUST** withdraw the student with a grade of "W", "WP", or "WF" depending on the date the student exceeded the allowed absences and the student's progress up to the last date of attendance
Or
Under extenuating circumstances and at the discretion of the faculty member teaching the class, allow the student to continue in the class and make-up the work. This exception must be documented at the time the allowed absences are exceeded.
- Absences are counted from the first day of class. There are no "excused" absences. All absences are counted, regardless of the reason for the absence.

- A student must take the final exam or be excused from the final exam in order to earn a non-withdrawal grade.
- A copy of TCL's STATEMENT OF POLICY NUMBER: 3-1-307 CLASS ATTENDANCE (WITHDRAWAL) is on file in the Division Office and in the Learning Resources Center.

Hazardous Weather

In case weather conditions are so severe that operation of the College may clearly pose a hardship on students and staff traveling to the College, notification of closing will be made through the following radio and television stations: WYKZ 98.7, WGCO 98.3, WGZO 103.1, WFXH 106.1, WWVW 106.9, WLOW 107.9, WGZR 104.9, WFXH 1130 AM, WLVA 101.1, WSOK 1230 AM, WAEV 97.3, WTOG TV, WTGS TV, WJWJ TV, and WSAV TV. Students, faculty and staff are highly encouraged to opt in to the Emergency Text Message Alert System. www.tcl.edu/textalert.asp

Emergency Text Message Alert

Students, faculty and staff are highly encouraged to opt in to the Emergency Text Message Alert System. Participants receive immediate notification of emergency events and weather cancellations via text messaging on their cell phones. Participants can also opt in to receive non-emergency news and announcements. Go to www.tcl.edu. On the homepage, click on "emergency TextAlert at TCL" and fill out the form or go to www.tcl.edu/textalert.asp