

JEFFERSON COLLEGE

COURSE SYLLABUS

HRA125

REFRIGERATION AND A/C MECHANICAL SYSTEMS

5 Credit Hours

Prepared by
William Kaune
November 30, 2010

Mary Beth Ottinger, Division Chair, Business & Technical Education
Elizabeth Check, Dean, Career & Technical Education

HRA125 Refrigeration and A/C Mechanical Systems

I. CATALOGUE DESCRIPTION

- A. Pre-requisites: HRA101 Basic Electricity and HRA105 Principles of Refrigeration
- B. 5 Credit Hours
- C. Covers various refrigeration systems and the components thereof. Emphasis on E.P.A. regulations, system evacuation, recovery, and charging methods. (F/S)

II. EXPECTED LEARNING OUTCOMES/ ASSESSMENT MEASURES

Students will employ proper environmental practices in lab and field	Lab Projects and E.P.A. Exam
Students will properly charge and evacuate refrigeration systems	Class Quizzes and In Lab Work
Students will properly recover refrigeration systems	Class Quizzes and In Lab Work
Students will assemble and wire the refrigeration trainers	Lab
Students will practice troubleshooting methods on mechanical refrigeration systems	Class Quizzes and Lab

III. OUTLINE OF TOPICS

- A. Refrigerant and Oil Chemistry and Management- Recovery, Recycling, Reclaiming, and Retrofitting
 - 1. Refrigerants and the environment
 - 2. Ozone depletion
 - 3. Global warming
 - 4. Refrigerants
 - a. CFC's
 - b. HCFC's
 - c. HFC's
 - d. HC's
 - 5. Naming refrigerants
 - 6. Refrigerant blends
 - 7. Popular refrigerants and their compatible oils
 - 8. Refrigerants oils and their applications

9. Oil groups
10. Regulations
11. Recover, Recycle, Reclaim
12. Methods of recovery
13. Mechanical recovery systems
14. Reclaiming refrigerants

B. System Charging

1. Charging a refrigeration system
2. Vapor refrigerant charging
3. Liquid refrigerant charging
4. Weighing refrigerant
5. Using charging devices
6. Using charging charts
7. Subcooling charging for TXV systems
8. Charging near-azeotropic refrigerant blends

C. Condensers

1. The condenser
2. Water cooled condensers
3. Tube-within-a-tube condensers
4. Mineral deposits
5. Cleanable condensers
6. Shell and coil condensers
7. Shell and tube condensers
8. Wastewater systems
9. Recirculated water systems
10. Evaporative condensers
11. Air-cooled condensers
12. High-efficiency condensers
13. Low ambient temperatures
14. Head pressure control
15. Using the Condenser superheat
16. Heat reclaim
17. Floating head pressures
18. Condenser evaluation
19. Service technician calls

D. Compressors

1. The function of the compressor
2. Types of compressors
3. Reciprocating compressor components
4. Belt drive mechanism characteristics
5. Direct drive compressor characteristics
6. Reciprocating compressor efficiency

7. Discus valve design
8. New technology in compressors
9. Liquid in the compressor cylinder
10. System maintenance and compressor efficiency

E. Expansion Devices

1. Expansion devices
2. Thermostatic Expansion Devices
3. TXV components
4. The valve body
5. The diaphragm
6. Needle and seat
7. The spring
8. The sensing bulb and transmission tube
9. Types of bulb charge
10. The liquid charge bulb
11. The cross liquid charge bulb
12. The vapor charge bulb
13. The cross vapor charge bulb
14. TXV with external equalizers
15. TXV response to load changes
16. TXV valve selection
17. Balanced port TXV
18. Dual port TXV
19. Pressure limiting TXV
20. Servicing the TXV
21. Sensing element installation
22. Solid state controlled expansion devices
23. Step motor expansion devices
24. Automatic expansion device
25. Automatic expansion valve response to load changes
26. Special considerations for the TXV and AXV
27. Capillary tube metering device
28. Operating charge for the capillary tube system

IV. METHOD(S) OF INSTRUCTION

- A. Lecture
- B. Videos
- C. Demonstrations
- D. Lab

V. REQUIRED TEXTBOOK(S)

Refrigeration and Air Conditioning Technology, (Current Edition), Whitman, Johnson, Tomczyk, and Silberstein

VI. REQUIRED MATERIALS

Hand Tools as specified in HRA basic tool list.

VII. Supplemental References

None

VIII. Method of Evaluation

A.	Exams	50%
B.	Quizzes	10%
C.	Labs	40%

IX. ADA AA STATEMENT

Any student requiring special accommodations should inform the instructor and the Coordinator of Disability Support Services (Technology Center 101; phone 636-481-3169).

X. ACADEMIC HONESTY STATEMENT

All students are responsible for complying with campus policies as stated in the Student Handbook (see College website, <http://www.jeffco.edu>).

XI. ATTENDANCE STATEMENT

Regular and punctual attendance is expected of all students. Any one of these four options may result in the student being removed from the class and an administrative withdrawal being processed: (1) Student fails to begin class; (2) Student ceases participation for at least two consecutive weeks; (3) Student misses 15 percent or more of the coursework; and/or (4) Student misses 15 percent or more of the course as defined by the instructor. Students earn their financial aid by regularly attending and actively participating in their coursework. If a student does not actively participate, he/she may have to return financial aid funds. Consult the College Catalog or a Student Financial Services representative for more details.

XII. OUTSIDE OF CLASS ACADEMICALLY RELATED ACTIVITIES

The U.S. Department of Education mandates that students be made aware of expectations regarding coursework to be completed outside the classroom. Students are expected to spend substantial time outside of class meetings engaging in academically related activities such as reading, studying, and completing assignments. Specifically, time spent on academically related activities outside of class combined with time spent in class meetings is expected to be a minimum of 37.5 hours over the duration of the term for each credit hour.