

Heating and Air Conditioning 1

Course Outcome Summary

Course Information

Organization	Madison Area Technical College
Developers	William Lorenz
Development Date	11/10/2005
Course Number	32-462-308
Instructional Level	Two-Year Technical Diploma
Potential Hours of Instruction	54
Total Credits	3

Description

Covers basic environmental equipment maintenance. Presents applications of HVAC components, refrigeration controls, condensers, hydronics, boilers, heat exchangers, dampers, compressors, plumbing, pumps, measurement, blowers and preventive maintenance/repair. Also covers EPA CFC certification.

Types of Instruction

Instruction Type	Contact Hours	Credits
Classroom Presentation	18	3
On-Campus Lab	36	

Textbooks

Whitman, W. C. & Johnson, W. M.. *Refrigeration & Air Conditioning Technology*. Delmar Publishing. **Edition:** 5. **Source:** Albany, NY.

Whitman, W. C. & Johnson, W. M.. *Refrigeration & Air Conditioning Technology Lab Manual*. **Edition:** 5. **Source:** Albany, NY.

Learner Supplies

Safety glasses.

3-ring binder for handouts. **Manufacturer:** ---.

hard-soled leather shoes. **Manufacturer:** ---.

Exit Learning Outcomes

Core Abilities

- A. Communication
- B. Critical thinking
- C. Ethics
- D. Science and Technology

Competencies

- A. Examine theory of heat

Competence will be demonstrated:

- A.1. by submitting completed homework
- A.2. on a written evaluation

Criteria - Performance will be satisfactory when:

- A.1. homework includes the definition of the quantity of heat
- A.2. homework includes the definition of the intensity of heat
- A.3. homework includes the calculation of the quantity of heat
- A.4. homework includes the calculation of the intensity of heat
- A.5. you read temperatures
- A.6. you calculate temperature
- A.7. you calculate British Thermal Units
- A.8. you differentiate between the transfer of heat by conduction, convection, and radiation
- A.9. you determine heat flow between substances of different temperatures (Delta T)
- A.10. you differentiate between sensible heat, latent heat, and specific heat
- A.11. you explore psig and psia as they apply to pressure gauges
- A.12. you identify specific kinds of matter
- A.13. you distinguish between the three states of matter
- A.14. you identify various kinds of density for heat calculations
- A.15. you calculation specific gravity, specific volume, and specific temperature
- A.16. you calculate work in terms of heat
- A.17. you calculate horsepower
- A.18. you use conversion formulas or charts for watts, horsepower, and the BTU
- A.19. you explain the term "ton of refrigeration"
- A.20. you summarize the basic refrigeration cycle
- A.21. you distinguish between the functions of the evaporator, compressor, condenser, and metering device
- A.22. you explain the function of refrigerants in an air conditioning system

B. Use appropriate shop practices and tools

Competence will be demonstrated:

- B.1. by submitting completed homework
- B.2. on a written evaluation
- B.3. in lab performance

Criteria - Performance will be satisfactory when:

- B.1. homework includes identifying the dangers of refrigerants
- B.2. homework includes identifying the dangers of electricity usage
- B.3. homework includes the importance of wearing safety glasses
- B.4. you identify the "Right to Know Law" and MSDS
- B.5. you summarize the laws pertaining to refrigerant use recovery
- B.6. you examine a deep vacuum
- B.7. you use the specialized HVAC/R tools
- B.8. you use test equipment to service HVAC/R equipment
- B.9. you distinguish between the various types of common fasteners
- B.10. you discriminate between the different types of tubing used in HVAC/R
- B.11. you demonstrate proper cutting, bending, and joining techniques for HVAC/R

- B.12. you demonstrate refrigerant recovery, evacuation, and charging of a refrigeration system
- B.13. you use different methods of charging a refrigeration system
- B.14. you use the different charging equipment available
- B.15. you demonstrate safe shop practices when working with pressurized systems, electrical energy, heat, cold, rotating machinery, chemicals, and when moving heavy objects

C. Use basic automatic controls

Competence will be demonstrated:

- C.1. by submitting completed homework
- C.2. on a written evaluation
- C.3. in lab performance

Criteria - Performance will be satisfactory when:

- C.1. homework includes the identification of the various types automatic controls
- C.2. homework includes an explanation of how each automatic control functions
- C.3. you distinguish between conductors and insulators
- C.4. you differentiate between AC and DC current
- C.5. you troubleshoot electrical circuits using Ohm's Law
- C.6. you make safe and accurate electrical measurements
- C.7. you use safely use different types of fuses
- C.8. you troubleshoot basic controls and circuits
- C.9. you read a basic ladder diagram

D. Troubleshoot and repair commercial refrigeration

Competence will be demonstrated:

- D.1. on a written evaluation
- D.2. in lab performance

Criteria - Performance will be satisfactory when:

- D.1. you summarize the different applications of refrigeration equipment
- D.2. you troubleshoot basic refrigeration problems
- D.3. you repair basic refrigeration problems
- D.4. you identify specialized refrigeration systems

E. Troubleshoot and repair electric motors

Competence will be demonstrated:

- E.1. on a written evaluation
- E.2. in lab performance

Criteria - Performance will be satisfactory when:

- E.1. you identify various types of electric motors
- E.2. you use various methods of motor starting
- E.3. you troubleshoot electric motors

F. Troubleshoot and repair air conditioning (heating and humidification)

Competence will be demonstrated:

- F.1. on a written evaluation
- F.2. in lab performance

Criteria - Performance will be satisfactory when:

- F.1. you demonstrate safe working practices for working with fossil fuel heating

equipment

F.2. you summarize safety features of fossil fuel heating equipment

F.3. you operate hydronic heat

F.4. you differentiate between the different methods of heating

F.5. you diagnose "Sick Building Syndrome"

F.6. you use various humidification equipment

F.7. you determine comfort

G. Troubleshoot and repair air conditioning (cooling)

Competence will be demonstrated:

G.1. on a written evaluation

G.2. in lab performance

Criteria - Performance will be satisfactory when:

G.1. you distinguish between the four factors involved in comfort

G.2. you use psychometrics for calculations in HVAC/R

G.3. you distinguish between package air conditioning equipment

G.4. you differentiate between mechanical and electrical troubleshooting problems

G.5. you troubleshoot an A/C system

G.6. you determine necessary changes in system balancing

G.7. you repair an A/C system, if necessary

H. Troubleshoot and repair air distribution and balance

Competence will be demonstrated:

H.1. on a written evaluation

H.2. in lab performance

Criteria - Performance will be satisfactory when:

H.1. you distinguish between the various air distribution systems

H.2. you take basic air-pressure measurements

H.3. you measure air quantities

H.4. you differentiate between types of duct system installations

H.5. you install duct systems

H.6. you troubleshoot air distribution and balance systems

H.7. you repair air distribution and balance systems, if necessary

I. Troubleshoot and repair all-weather systems

Competence will be demonstrated:

I.1. on a written evaluation

I.2. in lab performance

Criteria - Performance will be satisfactory when:

I.1. you explain year-round air conditioning

I.2. you explain how to vary air-flow between heating and cooling systems

I.3. you troubleshoot all-weather systems

I.4. you repair all-weather systems, if necessary

J. Distinguish between high and low pressure boilers

Competence will be demonstrated:

J.1. on a written evaluation

J.2. in lab performance

Criteria - Performance will be satisfactory when:

- J.1. you identify the basic components of low and high pressure boilers
- J.2. you examine the operation of the boiler controls
- J.3. you determine why boiler water treatment is necessary
- J.4. you determine the regulations that affect the operating environment of a boiler