

H.V.A.C. & R. I CURRICULUM

August 2011

H.V.A.C. & R. CURRICULUM – HVAC/R I

I. COURSE DESCRIPTION

The Exploratory H.V.A.C. & R. Curriculum will provide the student with the latest career information about the H.V.A.C. & R. industry such as contract work, trade unions and entrepreneurial opportunities. Basic hand and specialty tools and equipment will also be covered. Basic laws of heat transfer thermo-dynamics and understanding heat load. The introduction of green technology principals & practices as they apply to the HVAC/R industry. The practical work includes working with ACR tubing and fittings. The construction of copper tubing projects will be done along with cutting, brazing, bending and soldering of the tubing. The study of the basic refrigeration cycle and its components will be introduced. Refrigerants and the responsibility of the industry with regards to the environment and how the refrigerants affect it will also be covered. The students will also be introduced to sheet-metal work with regards to ductwork and the tools of the trade.

II. COURSE OBJECTIVES/OUTLINE ALIGNED WITH THE NJCCCS

A. SAFETY

NJCCCS 9.1, 9.2, 9.3, 9.4

Students will be able to:

1. Learn the proper and safe shop behavior & basic first aid procedures.
2. Wear the appropriate attire for working in a shop, including safety goggles.
3. Develop work habits, which will promote safety for themselves and others.
4. Complete the OSHA requirements for shop safety
5. Learn the safe and proper use of hand tools.
6. Learn the safe and proper use of power tools.
7. Learn the P.A.S.S. sequence for using portable fire extinguishers.
 - a. Pull the pin
 - b. Aim at the base of the fire
 - c. Squeeze the handle
 - d. Sweep the nozzle

B. Careers

NJCCCS 9.1, 9.2, 9.3, 9.4

Students will be able to:

1. Identify H.V.A.C. & R. Careers and Opportunities.
2. Develop the student's interest in H.V.A.C. & R. field as a career.
3. Learn about of different types of HVAC& R careers.

C. Basic Heat Transfer

NJCCCS 9.1, 9.2, 9.3, 9.4

Students will be able to:

1. Define terms: B.T.U., Latent heat, sensible heat, temperature as well as the pressure temperature relationship.
2. Calculate basic heat load problems.
3. Relate heat transfer to component function.

D. Tools and Tubing NJCCCS 9.1, 9.2, 9.3, 9.4

Students will be able to:

1. Identify ACR tubing
2. Identify & list specialty tools in H.V.A.C. & R.
3. Fabricate a tubing project.
4. Bend copper according to industry standards

E. Brazing and Soldering NJCCCS 9.1, 9.2, 9.3, 9.4

Student will be able to:

1. Identify brazing rods and fluxes.
2. List safety rules pertaining to brazing and soldering.
3. Produce several tubing projects using brazing and soldering methods.

F. Refrigerants NJCCCS 9.1, 9.2, 9.3, 9.4

Students will be able to:

1. Understand the function of refrigerants.
2. List applications of where refrigerants are used.
3. Understand the relationship between refrigerants and their affect on the environment. (Ex.)
The Montreal Protocols.

G. Basic Refrigeration Systems NJCCCS 9.1, 9.2, 9.3, 9.4

Students will be able to:

1. Identify different types of refrigeration systems.
2. Draw diagrams of refrigeration systems.
3. Understand system functions.

H. Fundamentals of Refrigeration NJCCCS 9.1, 9.2, 9.3, 9.4

Students will be able to:

1. List the states of matter.
2. Apply basic laws of physics to system components.
3. Relate states of matter to physics and system component function.

I. Refrigerant Recovery NJCCCS 9.1, 9.2, 9.3, 9.4

Students will be able to:

1. Be aware of refrigerant recovery theory and mechanics.
2. Understand the relationship between recovery theory and the laws governing the H.V.A.C. & R industry.

J. Air Conditioning Theory and Application NJCCCS 9.1, 9.2, 9.3, 9.4

Students will be able to:

1. List the basic laws of air conditioning.
2. Identify window air conditioning components.
3. Identify central air conditioning components and systems.
4. Identify ductwork for a central air conditioning system.

K. Special Refrigeration & A/C Applications NJCCCS 9.1, 9.2, 9.3, 9.4

Students will be able to:

1. Be made aware of ductless A/C systems.
2. List special refrigeration applications.

L. **Introduction to Green Awareness**

NJCCCS 9.1, 9.2, 9.3, 9.4

Students will be able to:

1. Be made aware of green technology theory
2. Discuss basic principals of green technology

III. METHODS OF STUDENT EVALUATION

Students will be evaluated using the following criteria:

Tests	= 40%
Quizzes	= 20%
Shop	= 20%
Classwork	= 10%
Participation	= 10%
Total	= 100%

IV. LIST OF TEXTBOOKS AND INSTRUCTIONAL MATERIALS & SOFTWARE

Refrigeration & Air Conditioning Technology

Whitman, Johnson, Tomczyk

1999 Delmar.

Albany, N.Y.

Videos

Careers in HVAC & R

Building Trades in H.V.A.C. & R.

ACCA – the three Rs

V. INSTRUCTIONAL STRATEGIES

In order to meet the individual needs of our students, differentiated instruction is utilized in every class. This involves the use of a variety of instructional strategies, including but not necessarily limited to: readings and exercises from the approved text(s) and related supplemental materials; hands-on practical projects; cooperative group activities; teacher generated handouts; lecture in conjunction with class discussion and notes; debates; role playing activities; oral and written reports; simulations; multimedia presentations; related field trips; and Internet and ITV presentations and conferences. All work is predicated upon the student's understanding the concepts taught previously or a review will be necessary prior to attempting any new work.

VI. Key: I = INTRODUCED
 D = DEVELOPED IN DEPTH
 R = REINFORCED

SCOPE AND SEQUENCE CHART

SUGGESTED GRADE LEVELS

	9	10	11	12
Understanding HVAC/R Careers	I, D			
Comprehending basic refrigeration tools	I			
Understanding how to work with ACR Copper	I			
Understanding how to braze & solder	I			
Comprehending the basics of refrigeration	I, D			
Comprehending the basics of sheet metal	I			
Understanding how system components work	I, D			
Understand how refrigerants affect the environment	I, D			
Understand the basic laws of air conditioning	I			
Practice shop safety procedures	I, D			
Understanding green awareness	I			
Comprehending green technology	I			

VII. PACING CHART

This course is a full year course taught in approximately 2 to 3 week increments. All new work is predicated on the student's understanding of previous concepts or a review will be necessary prior to attempting any new material.

Topics	Pacing
A. Safety	week 1
B. Careers	week 1 -- 2
C. Basic Heat Transfer	week 3 -- 5
D. Tools and Tubing	week 6 -- 8
E. Brazing and Soldering	week 9, 10
F. Refrigerants	week 11 -- 13
G. Basic Refrigeration Systems	week 14 -- 17
H. Fundamentals of Refrigeration	week 18 -- 21
I. Refrigerant Recovery	week 22 -- 24
J. Air Conditioning Theory and Application	week 25 -- 28
K. Special Refrigeration & A/C Applications	week 29 -- 32
L. Introduction to Green Awareness	week 33 -- 36

VIII. STUDENT HANDOUT HVAC/R I

Course Overview

The exploratory HVAC&R I Curriculum will provide the student with the latest career information about the H.V.A.C. & R. industry such as contract work, trade unions, entrepreneurial opportunities and green awareness basic theory. Basic hand and specialty tools and equipment will also be covered. Basic laws of heat transfer thermo-dynamics, understanding heat load and how green technology can be applied to the HVAC/R industry. The practical work includes working with ACR tubing and fittings. The construction of copper tubing projects will be done along with cutting, brazing, bending and soldering of the tubing. The study of the basic refrigeration cycle and its components will be introduced. Refrigerants and the responsibility of the industry with regards to the environment and how the refrigerants affect it will also be covered. The students will also be introduced to sheet-metal work with regards to ductwork and the tools of the trade.

Proficiencies

1. Demonstrate interest to advance to Refrigeration Level II.
2. Work cooperatively and effectively with others.
3. Demonstrate an awareness of occupational opportunities.
4. Understand the use of hand and specialty tools.
5. Demonstrate proper work habits.
6. Display diagrams of basic refrigeration systems.
7. Students will demonstrate how to swage copper tubing.
8. Students will demonstrate how to braze ACR tubing.
9. Students will be able to make & explain a tubing project.
10. Students will construct a fabricated sheet-metal project.
11. Students will identify refrigerants.
12. Students will be able to understand Green Technology Awareness.
13. Students will evaluate green awareness theory.