

H.V.A.C./R II Curriculum

August 2011

H.V.A.C. & R Curriculum – HVAC/R II

I. COURSE DESCRIPTION

The H.V.A.C. & R. II curriculum provides the student with the basic electro-mechanic laws of refrigeration. This includes the study of thermo dynamics, heat transfer and the practical application of green technology in the industry. Students are introduced to basic component identification and function in detail. Students learn how to use hand and power tools in a work environment. Students learn the basic refrigeration cycle and apply it to a live system. The refrigeration cycle is studied in depth along with all components. Basic electrical theory is introduced as well as working with OHMS Law. The basics of sheet metal, ductwork, airflow, energy efficiency and residential energy use awareness will be introduced. The refrigerants are covered in depth as well as retrofitting and refrigerant recovery and how it applies to the ACCA exam. Students will also begin preparing for the ACCA exam by studying the basics of the Montreal Protocols and how it applies to shop work. They will also begin studying for Green Awareness certification as it applies to the industry. Finally, students will learn piping skills and system maintenance techniques.

II. COURSE OBJECTIVES/OUTLINE ALIGNED WITH THE NJCCCS

A. Orientation

NJCCCS 9.1, 9.2, 9.3, 9.4

Students will be able to:

1. Become comfortable in the shop environment.
2. Learn required safety rules for the shop.
3. Work in a lab/shop environment.
4. Strengthen Shop safety techniques taught previously.

B. H.V.A.C.& R. Tools, Materials & Safety

NJCCCS 9.1, 9.2, 9.3, 9.4

Students will be able to:

1. Reinforce all safety procedures for the shop concerning electricity.
2. Become familiar with tools and materials of the H.V.A.C.&R industry & related safety issues.
3. Strengthen skills such as: flaring, swaging, bending, brazing and soldering.
4. Use trade tools properly & safely.
5. Identify tubing sizes.

C. Careers

NJCCCS 9.1, 9.2, 9.3, 9.4

Students will be able to:

1. List careers in the industry.
2. Describe the service work technicians do.
3. Describe the type of work that installers do.
4. Develop a career path in the H.V.A.C. & R. industry

D. Basic Refrigeration Systems

NJCCCS 9.1, 9.2, 9.3, 9.4

Students will be able to:

1. Enhance their understanding of refrigeration systems.
2. Describe how systems operate and achieve the desired effect.
3. Improve their understanding of heat transfer.
4. Learn about new types of systems.

- E. Compression Systems** NJCCCS 9.1, 9.2, 9.3, 9.4
Students will be able to:
1. List different types of compressors.
 2. Enhance his or her ability to recognize the parts of a compressor.
 3. Understand the function of lubrication.
 4. Understand the different types of compression systems.
- F. Refrigerant Controls** NJCCCS 9.1, 9.2, 9.3, 9.4
Students will be able to:
1. Describe the function of refrigerant controls.
 2. Identify different refrigerant controls.
 3. Set refrigeration controls according to industry standards.
- G. Fundamentals of Refrigeration** NJCCCS 9.1, 9.2, 9.3, 9.4
Students will be able to:
1. Enhance their understanding of pressure/temperature relationship.
 2. Understand heat flow.
 3. Improve the student's ability to calculate basic heat load problems.
- H. Electro-Mechanical Basics** NJCCCS 9.1, 9.2, 9.3, 9.4
Students will be able to:
1. Understand electron flow.
 2. List basic circuit fundamentals.
 3. Recognize the difference between a series and parallel circuit.
 4. Understand basic electrical safety.
- I. Refrigerants** NJCCCS 9.1, 9.2, 9.3, 9.4
Students will be able to:
1. Understand the function of refrigerants.
 2. List all CFC's, HFC refrigerants used on the ACCA examination.
 3. Be aware of the effect of CFC's on the Ozone Layer.
 4. Enhance the student's understanding of refrigerant recovery.
 5. Become familiar with retrofitting techniques.
 6. Prepare for ACCA exam.
- J. Sheet-metal & ductwork** NJCCCS 9.1, 9.2, 9.3, 9.4
Students will be able to:
1. Understand the function of ductwork.
 2. Work with ductwork & sheet metal safely.
 3. Understand metal trades careers.
 4. Become familiar with sheet-metal tools & sheet metal safety.
- K. Piping** NJCCCS 9.1, 9.2, 9.3, 9.4
Students will be able to:
1. Acquire skills pertaining to proper piping practices.
 2. Enhance his or her knowledge of piping techniques.

L. Preventive Maintenance

NJCCCS 9.1, 9.2, 9.3, 9.4

Students will be able to:

1. Develop proper preventive maintenance procedures.
2. Demonstrate preventive maintenance procedures

M. Understanding Green Technology

NJCCCS 9.1, 9.2, 9.3, 9.4

Students will be able to:

1. Understand the function of Green Technology.
2. Work with Green Technology Theory in the shop.
3. Apply the Green Awareness theory to shop applications.

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

Fundamentals of HVAC

Carter Stansfield, David Skaves
2009-2010
Prentiss Hall

Green Awareness

Korcal, Petit, Pacella, Campbell, Collins, Rasmussen
2008 ESCO Press & Ferris State University
U.S.A.

ACCA Manual J-for heat load calculation

International building Code council manual

V. INSTRUCTIONAL STRATEGIES

The H.V.A.C.& R. Level II is a basic program. Various teaching methods will be used. Program theory in a classroom environment is applied to the shop environment. Students will be challenged to think through problems and develop a plan for repair work. 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. Students will demonstrate their ability to work on fully functioning systems to apply green awareness and to make alterations as needed. Lectures and demos will be used to increase student comprehension of all subject matter. The student's notebook will be very important to passing the course. 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.

VI. SCOPE AND SEQUENCE CHART

SUGGESTED GRADE LEVELS

Key: I = INTRODUCED, D = DEVELOPED IN DEPTH, R = REINFORCED

	9	10	11	12
Drawing HVAC & R Diagrams		I,D		
Practice shop safety procedures	ID	DR		
Understanding how to braze & solder	I	D		
Understanding how to work with ACR copper	I	D		
Comprehending the basics of refrigeration	I	D		
Comprehending the basics of Sheet-metal	I	D		
Understanding how system components work	I	D		
Understanding how refrigerants affect the environment	I	D		
Understanding Heat Transfer Principals		ID		
Understand the basic laws of air conditioning	I	D		
Relating Pressure to Temperature		ID		
Fabricating a Tubing Project		ID		
Understanding The Basic Refrigeration Cycle		ID		
Retrofitting Systems to R-134A		I,D		
Understanding Superheat & Sub-cooled		I,D		
Understanding How to Read Manifold Gauges		I,D		
Understand How To Use a Vacuum Pump		I,D		
Understand how to recover a system		D,R		
Understanding electrical safety		ID		
Understanding Basic Electrical Controls & circuits		ID		
Understanding Basic sheet metal skills & Safety		D,R		
Understanding The Importance of HVAC & R.		D,R		
Preparing for the ACCA exam		I,D		
Understanding green awareness		I,D		
Comprehending Green Theory		I,D		
How to use Green awareness in shop situations		I,D		

VII. PACING CHART

The course will be taught in 2 week, 2 day 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. Orientation	week 1
B. H.V.A.C.& R. Tools, Materials & Safety	week 2
C. Careers	week 3
D. Basic Refrigeration Systems	week 4 – 8
E. Compression Systems	week 8 – 10
F. Refrigerant Controls	week 10 – 12
G. Fundamentals of Refrigeration	week 12 – 15
H. Electro-Mechanical Basics	week 16 – 18
I. Refrigerants	week 19
J. Sheet-metal & ductwork	week 20 – 24
K. Piping	week 25 – 28
L. Preventive Maintenance	week 29 – 32
M. Understanding Green Technology	week 33 -- 36

VIII. Student Handout HVAC/R II

Course Overview

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Proficiencies

1. Demonstrate skills to advance to HVAC/R III.
2. Display work co-operation with others.
3. List occupational opportunities.
4. Demonstrate & understand the proper use of HVAC/R tools.
5. Manipulate & use proper tubing techniques.
6. Demonstrate the ability to pipe a system.
7. Perform a system evacuation technique.
8. Demonstrate & define how to charge a system.
9. Expound & evaluate the wiring of a system.
10. Demonstrate ductwork fabrication skills.
11. Define & explain green awareness.
12. Use Green Technology in shop.