INTRODUCTION TO HVAC/R SAFETY, TOOLS & EQUIPMENT
Course Syllabus

Course Number: ARCO-0687  
OHLAP Credit: No
OCAS Code: None
Course Length: 30 Hours
Career Cluster: Architecture & Construction
Career Pathway: Maintenance/Operations
Career Major(s): HVAC Technician

Pre-requisite(s):

Course Description: This course is an introduction to air-conditioning and refrigeration, exploring career opportunities in the HVAC/R industry, personal safety and work practices, personal protective equipment, handling pressurized fluids, handling hazardous substances, hand and power tools, and equipment used to test and service heating, air conditioning, and refrigeration equipment, including those used to measure air flow.

Textbooks:

Refrigeration & Air Conditioning Technology, 7th Ed, (2013), Whitman /Johnson/ Tomczyk Silberstein / Publisher Delmar Cengage

Course Objectives:

A. Complete Administrative Forms and Requirements for Enrollment.
   1. Complete forms pertaining to enrollment.
   2. Discuss district, school, and class policies and procedures.
   3. Discuss grading criteria.

B. Participate in a Career Technology Student Organization.
   1. Discuss reasons for CTSO organization.
   2. Form a CTSO club.
   3. Participate in CTSO activities outlined in the PDP.

C. Complete an Introduction to HVAC.
   1. Explain the basic principles of heating, ventilation, and air conditioning.²
      a. Define air-conditioning and refrigeration.¹
      b. Explain the differences between air-conditioning and refrigeration.¹
      c. Define "air-conditioning" and relate to human comfort conditions.¹
      d. Discuss the differences between air-conditioning and heating.¹
      e. Discuss the various systems of air-conditioning.¹
         1. Mechanical compression cycle¹
         2. Evaporative cooling¹
         3. Desiccant dehumidification¹
         4. Absorption cycle¹
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f. Explain why ventilation is often inadequate.¹

g. Define heating.¹

h. Explain the various heating systems.¹
   1. Gas¹
   2. Oil¹
   3. Heat pump¹
   4. Electric resistance¹
   5. Hydronics¹
   6. Solar¹

2. Discuss the history and trends of the industry.
   a. Explain the history of air-conditioning and refrigeration.¹
   b. Understand the historical development of air-conditioning.¹

3. Identify career opportunities available to people in the HVAC trade.¹ ²

4. Compare salaries, benefits, etc., of union vs. non-union jobs.

5. Explain the purpose and objectives of an apprentice training program.²

6. Describe how certified apprentice training can start in high school.²

7. Discuss additional training available.

8. Describe the role of Trade Association.¹

9. Discuss State/National certification requirements.

10. Describe what the Clean Air Act means to the HVAC trade.²

D. Demonstrate Knowledge of Basic Safety.

1. Identify the responsibilities and personal characteristics of a professional craftsperson.²

2. Explain the role that safety plays in the construction crafts.²

3. Describe what job-site safety means.²

4. Explain the appropriate safety precautions around common job-site hazards.²

5. Demonstrate the use and care of appropriate personal protective equipment.²

6. Follow safe procedures for lifting heavy objects.²

7. Describe safe behavior on and around ladders and scaffolds.²

8. Explain the importance of the HazCom (Hazard Communication Standard) requirement and MSDSs (Material Safety Data Sheets).²

9. Describe fire prevention and fire fighting techniques.²

10. Define safe work procedures around electrical hazards.²

11. Discuss the role of OSHA and EPA in the Air Conditioning, Heating and Refrigeration industry.

12. Participate in a "right to know" workshop.

13. Discuss types and location of fire extinguishers.

14. Match types of fire extinguisher with description of fire.

15. Demonstrate proper lifting methods.

16. List personal safety rules.

17. Discuss accident prevention.

18. Explain the proper steps in reporting an accident.

19. Discuss current laws concerning "hazardous waste management" as it relates to HVAC industry.

20. Complete a safety pledge form.

21. Complete an individual shop safety inspection.

22. Pass safety test with 100% accuracy before working in shop.

E. Describe Proper Safety Procedures.

1. Describe proper procedures for working with pressurized systems and vessels.

2. Describe proper procedures for working with electric energy.

3. Describe proper procedures for working with heat.

4. Describe proper procedures for working with cold.
5. Describe proper procedures for working with rotating machinery.
6. Describe proper procedures for working with chemicals.
7. Describe proper procedures for moving heavy objects.

F. Understand Basic Rigging.
1. Identify and describe the use of slings and common rigging hardware.
2. Describe the basic inspection techniques and rejection criteria used for slings and hardware.
3. Describe the basic hitch configurations and their proper connections.
4. Describe basic load-handling safety practices.

G. Become Familiar with the Tools of the HVAC Trade.
1. Identify and state the use of the following tools:
   a. Pipe wrenches
   b. Torque wrenches
   c. Tinner’s and soft-faced hammers
   d. Hand cutting snips
   e. Hand and power hacksaws
   f. Drill press
   g. Measuring tools
2. Describe the general procedures for maintenance of most hand and power tools.
3. Describe or demonstrate the general safety precautions that must be followed when using most hand and power tools.

H. Identify and Use Air Conditioning and Heating Tools and Equipment.
1. Identify hand tools commonly used in the air conditioning, heating, and refrigeration trade.
2. Discuss proper use and care of hand tools.
3. Select and use the right tool for the right job.
4. Describe equipment used to install and service air conditioning, heating, and refrigeration systems.
5. Maintain tools.

I. Identify and Use Air Conditioning and Heating Specialty Tools and Equipment.
1. Match specialty tools with the type of jobs for which they are used.
2. Discuss procedure for working with high-pressure cylinders.
3. Explain operation and care of torches.
4. Use air-acetylene and oxyacetylene torches.
5. Discuss usage and operation of electrical test instruments.
6. Use electrical test instruments to diagnose problems.
7. Explain operation and usage of air-flow instruments.
8. Use air-flow instruments.

J. Use Vacuum Pumps.
1. Maintain vacuum pumps.
2. Use recovery machines.

1 ODCTE objective
2 NCCER objective
All unmarked objectives are TTC instructor developed.
Teaching Methods: The class will primarily be taught by the lecture and demonstration method and supported by various media materials to address various learning styles. There will be question and answer sessions over material covered in lecture and media presentations. Supervised lab time is provided for students to complete required projects.

Grading Procedures: 1. Students are graded on theory and shop practice and performance.
2. Each course must be passed with seventy (70%) percent or better.
3. Grading scale: A=90-100%, B=80-89%, C=70-79%, D=60-69%, F=50-59%.

Description of Classroom, Laboratories, and Equipment: Tulsa Technology Center campuses are owned and operated by Tulsa Technology Center School District No. 18. All programs provide students the opportunity to work with professionally certified instructors in modern, well-equipped facilities.

Available Certifications/College Credit: The student may be eligible to take state, national or industry exam after completion of the program. College credit may be issued from Oklahoma State University-Okmulgee or Tulsa Community College. See program counselor for additional information.

College Credit Eligibility: The student must maintain a grade point average of 2.0 or better.