



**VIRGINIA BEACH CITY PUBLIC SCHOOLS**  
CHARTING THE COURSE

*Department of Teaching & Learning*  
*Parent/Student Course Information*

*Air Conditioning, Refrigeration and Heating I*  
*(VO8503)*  
*Three Credits, One Year*  
*Grades 11 or 12*

*Counselors are available to assist parents and students with course selections and career planning. Parents may arrange to meet with the counselor by calling the school's guidance department.*

**COURSE DESCRIPTION**

This instructional program prepares students to install, repair, and maintain the operating conditions of heating, air conditioning and refrigeration systems. Students work with piping and tubing, study heat and electricity, install duct systems, and comply with EPA regulations. Completion of this sequence may prepare students for a number of certification exams, helpful for employment in a variety of HVAC occupations.

**CERTIFICATION**

HVAC Excellence: Air Conditioning, Basic Refrigeration and Charging, R-410A Certification  
EPA 608  
OSHA Certification  
National Occupational Competency Testing Institute (NOCTI) Assessment: HVAC

**STUDENT ORGANIZATION**

SkillsUSA is a co-curricular organization for all students enrolled in trade and industrial education programs. SkillsUSA is a partnership of students, teachers and industry working together to ensure America has a skilled workforce. SkillsUSA helps students excel by providing educational programs, events and competitions that support career and technical education (CTE) in the nation's classrooms. Students are highly encouraged to participate.

**PREREQUISITE**

None

**OPTIONS FOR NEXT COURSE**

Air Conditioning, Refrigeration and Heating II

**REQUIRED STUDENT TEXTBOOK**

None

## COMPETENCIES FOR AIR CONDITIONING, REFRIGERATION and HEATING I

### **Demonstrating Workplace Readiness Skills: Personal Qualities and People Skills**

- 1 Demonstrate positive work ethic.
- 2 Demonstrate integrity.
- 3 Demonstrate teamwork skills.
- 4 Demonstrate self-representation skills.
- 5 Demonstrate diversity awareness.
- 6 Demonstrate conflict-resolution skills.
- 7 Demonstrate creativity and resourcefulness.

### **Demonstrating Workplace Readiness Skills: Professional Knowledge and Skills**

- 8 Demonstrate effective speaking and listening skills.
- 9 Demonstrate effective reading and writing skills.
- 10 Demonstrate critical-thinking and problem-solving skills.
- 11 Demonstrate healthy behaviors and safety skills.
- 12 Demonstrate an understanding of workplace organizations, systems and climates.
- 13 Demonstrate lifelong-learning skills.
- 14 Demonstrate job-acquisition and advancement skills.
- 15 Demonstrate time-, task- and resource-management skills.
- 16 Demonstrate job-specific mathematics skills.
- 17 Demonstrate customer-service skills.

### **Demonstrating Workplace Readiness Skills: Technology Knowledge and Skills**

- 18 Demonstrate proficiency with technologies common to a specific occupation.
- 19 Demonstrate information technology skills.
- 20 Demonstrate an understanding of Internet use and security issues.
- 21 Demonstrate telecommunications skills.

### **Examining All Aspects of an Industry**

- 22 Examine aspects of planning within an industry/organization.
- 23 Examine aspects of management within an industry/organization.
- 24 Examine aspects of financial responsibility within an industry/organization.
- 25 Examine technical and production skills required of workers within an industry/organization.
- 26 Examine principles of technology that underlie an industry/organization.
- 27 Examine labor issues related to an industry/organization.
- 28 Examine community issues related to an industry/organization.
- 29 Examine health, safety and environmental issues related to an industry/organization.

### **Addressing Elements of Student Life**

- 30 Identify the purposes and goals of the student organization.
- 31 Explain the benefits and responsibilities of membership in the student organization as a student and in professional/civic organizations as an adult.
- 32 Demonstrate leadership skills through participation in student organization activities, such as meetings, programs and projects.
- 33 Identify Internet safety issues and procedures for complying with acceptable use standards.

### **Applying Basic Construction Safety Standards (Core Safety)**

- 34 Comply with federal, state, and local safety requirements, including OSHA, VOSH and the EPA.
- 35 Identify personal protective equipment (PPE) requirements.
- 36 Inspect and maintain a safe working environment.

- 37 Explain safe working practices around electrical hazards.
- 38 Identify emergency first-aid procedures.
- 39 Identify the types of fires and the methods used to extinguish them.
- 40 Inspect course-specific hand and power tools to visually identify defects.
- 41 Demonstrate lifting and carrying techniques.
- 42 Demonstrate safe laddering techniques.
- 43 Demonstrate safe scaffolding techniques.
- 44 Report personal injuries, environmental issues, and equipment safety violations to the appropriate authority.
- 45 Demonstrate lockout and tagout procedures.
- 46 Earn the OSHA 10 card.
- 47 Pass safety test for shop or site safety and for specific tool use.

### **Understanding the Theory of Heat**

- 48 Describe the changing states of matter.
- 49 Describe the refrigeration process and the basic refrigeration components (e.g., compressor, condenser coil, metering device, evaporator coil).
- 50 Describe the relationship of pressures and fluids at saturation temperatures.
- 51 Identify the British thermal unit (BTU) and types of heat.

### **Working with Piping and Tubing**

- 52 Demonstrate torch safety.
- 53 Connect pipe, using threaded joint.
- 54 Connect pipe, using cemented joint.
- 55 Connect tubing, using compression fitting.
- 56 Connect tubing, using flare fitting.
- 57 Connect tubing and fitting, using a soft solder joint.
- 58 Connect tubing, using a swaged, brazed joint and nitrogen.
- 59 Shape tubing run with offset and corner, using the bending tool.

### **Understanding Basic Electricity**

- 60 Interpret a schematic diagram.
- 61 Draw a schematic diagram.
- 62 Calculate voltage, amperage, and resistance in series and parallel circuits.
- 63 Determine the appropriate wire size, based on equipment load amperage.
- 64 Measure voltages in electrical circuits.
- 65 Measure amperage in electrical circuits.
- 66 Measure resistance in electrical circuits.
- 67 Test electrical circuits for continuity.
- 68 Test equipment and motor windings for grounds, opens and shorts.
- 69 Measure capacitance of a capacitor.
- 70 Make electrical connections.
- 71 Install electrical components.
- 72 Troubleshoot high-voltage and low-voltage electrical systems.

### **Servicing and Maintaining Refrigeration Systems**

- 73 Perform routine preventive maintenance on refrigeration systems.
- 74 Compare electrical problems to those that are mechanical.
- 75 Demonstrate use of a refrigeration manifold gauge.
- 76 Measure superheat and sub cooling.
- 77 Locate a leak in charged refrigerant circuits, using various leak detection methods.

- 78 Locate a leak in an uncharged refrigerant circuit, using nitrogen pressurization or trace gas.
- 79 Replace a filter-drier.
- 80 Evacuate and charge a refrigeration circuit (new or contaminated system).
- 81 Repair a leak in a refrigerant circuit.
- 82 Identify various types of compressors.
- 83 Add oil to a compressor.
- 84 Adjust pressure to turn on an operating refrigeration system.
- 85 Adjust the temperature switch.
- 86 Adjust defrost cycle.
- 87 Attempt to start a stuck hermetic (single-phase) compressor.
- 88 Test refrigerant system for acid.
- 89 Replace a compressor.

### **Understanding Motors and Controls**

- 90 Connect single-phase motors.
- 91 Reverse the rotation of a single-phase motor.
- 92 Troubleshoot the starting components of a single-phase motor.
- 93 Install a hard-start kit on a hermetic compressor.
- 94 Install a motor contactor.
- 95 Replace a start or a run capacitor.
- 96 Replace a starting relay.
- 97 Replace a motor overload protector.

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For further information please call (757) 263-1070.

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To seek resolution of grievances resulting from alleged discrimination or to report violations of these policies, please contact the Title VI/Title IX Coordinator/Director of Student Leadership at (757) 263-2020, 1413 Laskin Road, Virginia Beach, Virginia, 23451 (for student complaints) or the Section 504/ADA Coordinator/Chief Human Resources Officer at (757) 263-1133, 2512 George Mason Drive, Municipal Center, Building 6, Virginia Beach, Virginia, 23456 (for employees or other citizens). Concerns about the application of Section 504 of the Rehabilitation Act should be addressed to the Section 504 Coordinator/ Executive Director of Student Support Services at (757) 263-1980, 2512 George Mason Drive, Virginia Beach, Virginia, 23456 or the Section 504 Coordinator at the student's school. For students who are eligible or suspected of being eligible for special education or related services under IDEA, please contact the Office of Programs for Exceptional Children at (757) 263-2400, Laskin Road Annex, 1413 Laskin Road, Virginia Beach, Virginia, 23451.

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