



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 Personal Qualities and Abilities

- 1 Demonstrate creativity and innovation.
- 2 Demonstrate critical thinking and problem solving.
- 3 Demonstrate initiative and self-direction.
- 4 Demonstrate integrity.
- 5 Demonstrate work ethic.

Demonstrating Interpersonal Skills

- 6 Demonstrate conflict-resolution skills.
- 7 Demonstrate listening and speaking skills.
- 8 Demonstrate respect for diversity.
- 9 Demonstrate customer service skills.
- 10 Collaborate with team members.

Demonstrating Professional Competencies

- 11 Demonstrate big-picture thinking.
- 12 Demonstrate career- and life-management skills.
- 13 Demonstrate continuous learning and adaptability.
- 14 Manage time and resources.
- 15 Demonstrate information-literacy skills.
- 16 Demonstrate an understanding of information security.
- 17 Maintain working knowledge of current information-technology (IT) systems.
- 18 Demonstrate proficiency with technologies, tools, and machines common to a specific occupation.
- 19 Apply mathematical skills to job-specific tasks.
- 20 Demonstrate professionalism.
- 21 Demonstrate reading and writing skills.
- 22 Demonstrate workplace safety.

Examining All Aspects of an Industry

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

Addressing Elements of Student Life

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

Exploring Work-Based Learning

- 35 Identify the types of work-based learning (WBL) opportunities.
- 36 Reflect on lessons learned during the WBL experience.
- 37 Explore career opportunities related to the WBL experience.
- 38 Participate in a WBL experience, when appropriate.

Applying Basic Construction Safety Standards (Core Safety)

- 39 Comply with federal, state, and local safety requirements, including OSHA, VOSH, and the EPA.
- 40 Identify personal protective equipment (PPE) requirements.
- 41 Inspect and maintain a safe working environment.
- 42 Explain safe working practices around electrical hazards.
- 43 Identify emergency first-aid procedures.
- 44 Identify the types of fires and the methods used to extinguish them.
- 45 Inspect course-specific hand and power tools to visually identify defects.
- 46 Demonstrate lifting and carrying techniques.
- 47 Demonstrate safe laddering techniques.
- 48 Demonstrate safe scaffolding techniques.
- 49 Report personal injuries, environmental issues, and equipment safety violations to the appropriate authority.
- 50 Demonstrate lockout and tagout procedures.
- 51 Earn the OSHA 10 card.
- 52 Pass safety test for shop or site safety and for specific tool use.

Understanding the Theory of Heat

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

Working with Piping and Tubing

- 57 Demonstrate torch safety.
- 58 Connect pipe, using threaded joint.
- 59 Connect pipe, using cemented joint.
- 60 Connect tubing, using compression fitting.
- 61 Connect tubing, using flare fitting.
- 62 Connect tubing and fitting, using a soft solder joint.
- 63 Connect tubing, using a swaged, brazed joint and nitrogen.
- 64 Shape tubing run with offset and corner, using the bending tool.

Understanding Basic Electricity

- 65 Interpret a schematic diagram.
- 66 Draw a schematic diagram.
- 67 Calculate voltage, amperage, and resistance in series and parallel circuits.
- 68 Determine the appropriate wire size, based on equipment load amperage.
- 69 Measure voltages in electrical circuits.
- 70 Measure amperage in electrical circuits.
- 71 Measure resistance in electrical circuits.
- 72 Test electrical circuits for continuity.
- 73 Test equipment and motor windings for grounds, opens, and shorts.

- 74 Measure capacitances of a capacitor.
- 75 Make electrical connections.
- 76 Install electrical components.
- 77 Troubleshoot high-voltage and low-voltage electrical systems.

Servicing and Maintaining Refrigeration Systems

- 78 Perform routine preventive maintenance on refrigeration systems.
- 79 Compare electrical problems to those that are mechanical.
- 80 Demonstrate use of a refrigeration manifold gauge.
- 81 Measure superheat and subcooling.
- 82 Locate a leak in charged refrigerant circuits, using various leak detection methods.
- 83 Locate a leak in an uncharged refrigerant circuit, using nitrogen pressurization or trace gas.
- 84 Replace a filter-drier.
- 85 Evacuate and charge a refrigeration circuit (new or contaminated system).
- 86 Repair a leak in a refrigerant circuit.
- 87 Identify various types of compressors.
- 88 Add oil to a compressor.
- 89 Adjust pressure to turn on an operating refrigeration system.
- 90 Adjust the temperature switch.
- 91 Adjust defrost cycle.
- 92 Attempt to start a stuck hermetic (single-phase) compressor.
- 93 Test refrigerant system for acid.
- 94 Replace a compressor.

Understanding Motors and Controls

- 95 Connect single-phase motors.
- 96 Reverse the rotation of a single-phase motor.
- 97 Troubleshoot the starting components of a single-phase motor.
- 98 Install a hard-start kit on a hermetic compressor.
- 99 Install a motor contactor.
- 100 Replace a start or a run capacitor.
- 101 Replace a starting relay.
- 102 Replace a motor overload protector.

Complying with EPA Laws and Regulations

- 103 Identify regulations affecting ozone depletion.
- 104 Identify the evacuation requirements for small appliances.
- 105 Detect non-condensables, using the pressure and temperature relationship (i.e., the P/T chart).
- 106 Install high-side and low-side access valves when recovering refrigerant from small appliances with inoperative compressors.
- 107 Recover refrigerants with system-dependent (passive) and self-contained (active) recovery methods.
- 108 Remove the solderless access fitting at the conclusion of service.
- 109 Identify annual leak rates for commercial and industrial process refrigeration and for other appliances containing more than 50 pounds of refrigerant.
- 110 Identify high-pressure and low-pressure recovery techniques and requirements.
- 111 Identify the components of high-pressure and low-pressure appliances and the state of refrigerant.
- 112 Identify pressure-temperature relationships of high-pressure and low-pressure refrigerants.
- 113 Obtain the EPA Section 608 certification.

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Produced by the Department of Teaching and Learning.
For further information, please call (757) 263-1070.

Notice of Non-Discrimination Policy

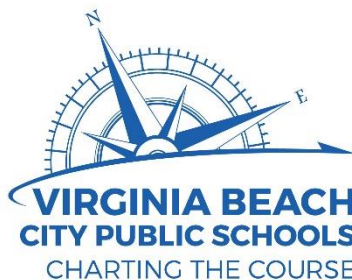
Virginia Beach City Public Schools does not discriminate on the basis of race, color, religion, national origin, sex, sexual orientation/gender identity, pregnancy, childbirth or related medical condition, disability, marital status, age, genetic information or veteran status in its programs, activities, employment, or enrollment, and provides equal access to the Boy Scouts and other designated youth groups. School Board policies and regulations (including, but not limited to, Policies 2-33, 4-4, 5-7, 5-19, 5-20, 5-44, 6-33, 6-7, 7-48, 7-49, 7-57 and Regulations 4-4.1, 4-4.2, 5-44.1, 7-11.1, 7-17.1 and 7-57.1) provide equal access to courses, programs, enrollment, counseling services, physical education and athletic, vocational education, instructional materials, extracurricular activities and employment.

Title IX Notice: Complaints or concerns regarding discrimination on the basis of sex or sexual harassment should be addressed to the Title IX Coordinator, at the VBCPS Office of Student Leadership, 641 Carriage Hill Road, Suite 200, Virginia Beach, 23452, (757) 263-2020, Mary.Dees@vbschools.com (student complaints) or the VBCPS Department of School Leadership, 2512 George Mason Drive, Municipal Center, Building 6, Virginia Beach, Virginia, 23456 (757) 263-1088, Elizabeth.Bryant@vbschools.com (employee complaints). Additional information regarding Virginia Beach City Public Schools' policies regarding discrimination on the basis of sex and sexual harassment, as well as the procedures for filing a formal complaint and related grievance processes, can be found in School Board Policy 5-44 and School Board Regulations 5-44.1 (students), School Board Policy 4-4 and School Board Regulation 4-4.3 (employees), and on the School Division's website at [Diversity, Equity and Inclusion/Title IX](#). 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, Plaza Annex/Family and Community Engagement Center, 641 Carriage Hill Road, Suite 200, Virginia Beach, VA 23452.

The School Division is committed to providing educational environments that are free of discrimination, harassment, and bullying. Students, staff, parents/guardians who have concerns about discrimination, harassment, or bullying should contact the school administration at their school. Promptly reporting concerns will allow the school to take appropriate actions to investigate and resolve issues. School Board Policy 5-7 addresses non-discrimination and anti-harassment, Policy 5-44 addresses sexual harassment and discrimination based on sex or gender. Policy 5-36 and its supporting regulations address other forms of harassment.

Alternative formats of this publication which may include taped, Braille, or large print materials are available upon request for individuals with disabilities. Call or write The Department of Teaching and Learning, Virginia Beach City Public Schools, 2512 George Mason Drive, P.O. Box 6038, Virginia Beach, VA 23456-0038. Telephone 263-1070 (voice); fax 263-1424; 263-1240 (TDD) or email at Brandon.Martin@vbschools.com.

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August 2021