Air Conditioning, Heating, and Refrigeration Technology

10-601-1 Associate Degree

Financial Aid Eligible

Program Overview

The air conditioning and refrigeration industry is one of the fastest growing occupations. This program will prepare you to design, install, service, maintain, and operate HVAC/R systems in residential, public, and light commercial buildings. You will be trained to service systems in residential homes, hospitals, government buildings, schools, hotels and motels, apartment buildings, and office buildings.

Offered at:

Superior

Student Profile

As a student of this program, you should be able to:

- Learn mechanical principles and repair techniques
- Use good judgment
- Follow procedures carefully
- Handle and manipulate tools and equipment skillfully
- Assume responsibility for your work
- Adhere to required standards
- Adapt and handle a variety of duties and interruptions
- Work under pressure
- Move easily and lift 50 pounds
- Distinguish colors

Preparation for Admission

The following experiences will help you prepare for this program:

- General Math/Algebra
- Science
- Communications
- Health/Human Relations

Program Outcomes

Empolyers will expect you, as an Air Conditioning, Heating, and Refrigeration Technology graduate, to be able to:

- Practice safe techniques when servicing and testing HVAC/R systems.
- Troubleshoot HVAC/R systems.
- Use tools and equipment to service and/or test HVAC/R systems.
- Select equipment to install for an HVAC/R system.
- Estimate HVAC/R repair cost and order parts.
- Meet requirements for EPA Refrigeration Certificate.
- Interpret HVAC/R drawings.
- Estimate a heating and cooling load.
- Communicate HVAC/R service reports for customers.

Career Outlook

After graduating from the program, you will be ready to start your career as a(n):

- Residential HVAC/R Technician
- Commercial HVAC/R Technician
- Industrial HVAC/R Technician
- Mechanical Contractor HVAC/R Technician
- Facilities HVAC/R Technician
- Wholesale Service Representative

With additional education and/or work experience, graduates may find other opportunities for employment:

- Energy Management Technician
- Business Owner HVAC/R
- Practice Engineering of HVAC/R Systems

Curriculum

Number	Course Title	Credits
Technical studies Courses		
10106181	Keyboarding	1
10601105	Sheet Metal Fabrication ▲	2
10601110	Air Conditioning Fundamentals	3
10601115	Basic Mechanical Fundamentals	3
10601121	Heating Systems	3
10601128	Electrical Controls and Systems	3
10601130	HVAC Print Reading	2
10601131	Heating System Applications ▲	3
10601133	Refrigeration Fundamentals	3
10601142	Hydronic Heating ▲	3
10601143	Refrigeration Applications ▲	3
10601145	Electronic Energy Management ▲	3
10601147	Control Circuit Applications ▲	3
10601148	HVAC Electronic Troubleshooting and Repair (WBL) ▲	3
10601149	Heat Load Estimation	2
10605112	Principles of AC/DC ▲	3
10890110	Information Resources	3
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General Studies Courses		
10801195	Written Communication ◆	3
10801197	Technical Reporting ▲	3
10801196	Oral/Interpersonal Communication	3
10804113	College Technical Mathematics 1A	3
10806169	Energy in Nature, Technology, and Society	3
10809196	Introduction to Sociology	3
10809199	Psychology of Human Relations	3
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PROGRAM REQUIREMENTS		**67**

▲ This course requires a prerequisite and/or corequisite, and must be completed with a grade of "C-" or better.

◆ Appropriate placement score or Introduction to College Writing course required.

10106181
Keyboarding - Credits: 1
This hands-on course emphasizes the introductory skills necessary in keyboarding using the touch system. You will master basic keyboard operation and develop keyboarding skills using the alpha, numeric, and symbol keys.

10601105
Sheet Metal Fabrication - Credits: 2
The layout and fabrication of a variety of sheet metal fittings. PREREQUISITE: 10601115 Basic Mechanical Fundamentals.

10601110
Air Conditioning Fundamentals - Credits: 3
Topics covered include air conditioning principles and terms, physical principles of air movement and humidity, methods of conditioning air for comfort and health, the proper use of psychrometers, dry bulb thermometers, hygrometers, pitot tubes, recorders, manometers and barometers, and the reading and interpretation of psychrometric charts and scales.

10601115
Basic Mechanical Fundamentals - Credits: 3
This course is designed to introduce the learner to the basic fundamental skills necessary to work in the HVAC/R Industry. Instruction will be given in learning the various types of piping and tubing used in air conditioning, heating, and refrigeration; types of fittings, bending, brazing, soft soldering tubing, black iron pipe work, using hand tools, and the recognition and practice of safety procedures while working on heating, air conditioning, and refrigeration systems.

10601121
Heating Systems - Credits: 3
Topics include introduction to heat principles, temperature measurement, fuels and other sources of heat, combustion, basic heating systems, basic furnace design, gas furnace design and operation, venting of furnaces, chimney or exhaust gases, and system controls.

10601128
Electrical Controls & Systems - Credits: 3
Topics in this course include basic electricity review, control circuits, symbols, diagrams, protection devices, transformers, relays, thermostats, single-phase motors, capacitors, control components, and troubleshooting ACR system wiring diagrams. Electrical experience equivalent to 10605112 Principles of AC/DC is recommended.

10601130
HVAC Print Reading - Credits: 2
Topics include print reading; understanding, interpreting, and utilizing architectural working drawings; safety procedures, drafting techniques, and lettering.

10601131
Heating System Applications - Credits: 3
Topics include installation, start-up, and service of gas- and oil-fired heating equipment; air conditioning and air-to-air heat pump systems; and electrical and mechanical testing/analyzing of system components. PREREQUISITES: 10601115 Basic Mechanical Fundamentals and 10601121 Heating Systems.

10601133
Refrigeration Fundamentals - Credits: 3
Topics include refrigeration principles and terms, thermodynamic processes, refrigerants, vapor compression cycles, mechanical refrigeration system components, use of electrical controls, refrigeration applications, and refrigeration tools and materials.

10601142
Hydronic Heating - Credits: 3
Topics include heating ignition systems, oil boiler installation and start up, venting of gas-fired boilers, heating with hot water, multiple boiler systems basics, and zoning hydronic heating systems. PREREQUISITES: 10601115 Basic Mechanical Fundamentals and 10601121 Heating Systems.

10601143
Refrigeration Applications - Credits: 3
Topics include domestic and commercial refrigeration systems, applications, installation, servicing, troubleshooting, heat loads and piping, controls, and special refrigeration components. PREREQUISITES: 10601110 Air Conditioning Fundamentals, 10601115 Basic Mechanical Fundamentals, and 10601133 Refrigeration Fundamentals.

10601145
Electronic Energy Management - Credits: 3
This course serves as an introduction to how a heating, venting, and air conditioning control system is used to operate a building's mechanical equipment so as to maintain the desired environmental conditions. COREQUISITE: 10601147 Control Circuit Applications.

10601147
Control Circuit Applications - Credits: 3
Topics include control circuit terminology, measuring devices, and control systems. The principles of self-contained, electromechanical, and electronic-electric controls are examined and applied to control systems operation and design. PREREQUISITE: 10601128 Electrical Controls and Systems.

10601148
HVAC Electronic Troubleshooting and Repair (WBL) - Credits: 3
This course is designed for the advanced student who has already completed the theoretical and basic hands-on classes. In this class the student will be responsible for troubleshooting and repairing a variety of HVAC/R equipment. The student will be required to diagnose the faulty equipment, select the proper replacement parts, return the equipment to a working condition, and prepare a detailed work order listing all work performed. PREREQUISITE: 10601147 Control Circuit Applications.

10601149
Heat Load Estimation - Credits: 2
This course will teach the student how to use "Manual J" from ACCA. The student will develop the skills to do residential heating and cooling heat loads. Students will calculate heat loss and also losses or gains due to infiltration, sun loads etc. The student will do calculations on actual buildings using ACCA industry standard form J-1. The student will also be pricing energy upgrades such as insulation, window improvements, etc. and calculating payback and fuel savings.

10605112
Principles of AC/DC - Credits: 3
This course provides an introduction to DC and AC electricity. The students will be able to perform basic resistance, current, voltage, and power calculations and measurements in both DC and AC circuits. Knowledge and use of test equipment will focus on multimeters and oscilloscopes. Critical thinking skills are emphasized to develop competencies in problem solving and troubleshooting. This is a lab- and lecture-based course that provides hands-on and theoretical learning. COREQUISITE: 10804113 College Technical Mathematics 1A.

10890110
Information Resources - Credits: 3
This course will allow the learner to develop skills in research, evaluation, selection, and preparation of information resources useful to their career area. Learners will use various information resources, including computer software applications to develop sound information research strategies. Learners will be exposed to ethical use of information, information provided by various methods and stored in various management formats, communicating by e-mail, developing search and selection of information resources, analysis, and use of results. This discussion and lab-based course will use individual and group work to search and share information resources. Competencies learned in this course will be able to be applied in other courses within your program and will continue to be valuable in lifelong learning. You should have experience in keyboarding and basic computer skills for this course.

Graduate Employment Information

(WITC Graduate Survey Responses 2005-2006)

career vision

Number of graduates	10	Number employed	7	% employed in WITC district	20%
Number of responses	8	Percent employed	88%	Range of yearly salary	$20,798-$29,898
Number available for employment	8	Employed in related field	5	Average yearly salary	$25,899