

Program Overview

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

Campus:

Superior



Special Feature

This program is unique in the state.

Admission Requirements

Students in this program must:

- Complete application form and submit with fee (fee waiver may apply if previously submitted)
- Complete Accuplacer entrance assessment to determine placement (waiver may apply with acceptable alternative test scores and/or postsecondary degree completion)
- Complete admissions interview with a WITC counselor (above requirements should be completed prior to interview)

Student Profile

Students of this program 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 their 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

Students should strive to reach a comfort level in the following courses or skills:

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

Program Outcomes

Employers will expect graduates of this program 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 the EPA Refrigeration Certificate
- Interpret HVAC/R drawings
- Estimate a heating and cooling load
- Communicate HVAC/R service reports for customers

Collegewide outcomes and indicators will also be addressed to develop personal awareness, career effectiveness, and professionalism. See page 5 for a list of collegewide outcomes and indicators.

Career Outlook

Typical positions available after graduation include:

- 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
Occupational Specific Courses		
10480105	Alternative Energy Overview	3
32601300	Air Conditioning Fundamentals ▲	2
32601301	Basic Mechanical Fundamentals ▲	3
32601302	Refrigeration Fundamentals ▲	2
32601303	Principles of AC/DC ▲	3
32601304	Heating Systems ▲	2
32601305	Electrical Controls and Systems	3
32601306	HVAC/R Print Reading ▲	2
32601307	Heating System Applications ▲	3
32601308	Electronic Energy Management ▲	3
32601309	Control Circuit Applications ▲	3
32601310	Sheet Metal Fabrication ▲	2
32601311	Hydronic Heating ▲	3
32601312	Refrigeration Applications ▲	3
32601313	HVAC/R Electronic Troubleshooting/Repair (WBL) ▲	2
32601314	Heat Load Estimation ▲	1
32601315	Geothermal Systems ▲	2
32890305	Applied Information Resources	<u>2</u>
		44
Occupational Supportive/General Studies Courses ▽		
32804355	Math 355	3
32804364	Math 364 ▲	2
32801361	Applied Communications 1	2
32801363	Applied Communications 2 ▲	2
32809371	Applied Human Relations	<u>2</u>
		11
	PROGRAM REQUIREMENTS	55

▲ Requires a prerequisite and/or corequisite that must be completed with a grade point of 2.0 or better.

▽ See page 40 for General Studies course descriptions.

Course Descriptions

(See page 40 for General Studies course descriptions)

10480105

Alternative Energy Overview - Credits: 3

In this course, students will investigate the need for renewable energy systems and emerging careers in renewable energy. Students will examine the basic design, cost, and other considerations associated with photovoltaic, wind, hydro and biogas electrical generation systems. In addition, students will evaluate the basic design, costs, truths and myths associated with solar thermal, geothermal, and biomass heating and cooling systems and explore the production and use of alternative transportation fuels. Students will also perform a site assessment for the installation of a renewable energy system.

32601300

Air Conditioning Fundamentals - Credits: 2

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. PREREQUISITE: Admission to HVAC/R Plan.

32601301

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. PREREQUISITE: Admission to HVAC/R Plan.

32601302

Refrigeration Fundamentals - Credits: 2

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. PREREQUISITE: Admission to HVAC/R Plan.

32601303

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: 32804355 Math 355.

32601304

Heating Systems - Credits: 2

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. PREREQUISITE: Admission to HVAC/R Plan.

32601305

Electrical Controls and 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 32601303 Principles of AC/DC is recommended.

32601306

HVAC/R Print Reading - Credits: 2

Topics include print reading; understanding, interpreting, and utilizing architectural working drawings; safety procedures; drafting techniques; and lettering. PREREQUISITE: Admission to HVAC/R Plan.

32601307

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: 32601301 Basic Mechanical Fundamentals and 32601304 Heating Systems.

32601308

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. PREREQUISITE: 32601309 Control Circuit Applications.

32601309

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: 32601305 Electrical Controls and Systems.

32601310

Sheet Metal Fabrication - Credits: 2

The layout and fabrication of a variety of sheet metal fittings. PREREQUISITE: 32601301 Basic Mechanical Fundamentals.

32601311

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: 32601301 Basic Mechanical Fundamentals and 32601304 Heating Systems.

32601312

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: 32601300 Air Conditioning Fundamentals, 32601301 Basic Mechanical Fundamentals, and 32601302 Refrigeration Fundamentals.

32601313

HVAC/R Electronic Troubleshooting/Repair (WBL) - Credits: 2

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: 32601309 Control Circuit Applications.

32601314

Heat Load Estimation - Credits: 1

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. PREREQUISITE: Admission to HVAC/R Plan.

32601315

Geothermal Systems - Credits: 2

This course is designed to introduce the student to the basic concepts of geothermal heating and cooling. Students will be introduced to the concepts of geothermal heating and cooling using geothermal pumps, ground source heat exchangers, indoor heat exchangers, connecting devices, and circulating fluid configurations and fusions. PREREQUISITES: 32601301 Basic Mechanical Fundamentals, 32601302 Refrigeration Fundamentals, and 32601305 Electrical Controls and Systems.

32890305

Applied Information Resources - Credits: 2

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.

Gainful employment information is available at this link: <http://www.witc.edu/pgmpages/airhtgref/career.htm>. This information is provided as a federal requirement in an effort to help students make informed decisions related to the costs and potential employment in a chosen field.

Graduate Employment Information

(WITC Graduate Survey Responses 2009-2010; for most recent data, go to [witc.edu](http://www.witc.edu))*

Number of graduates	3	Number employed	2	% employed in WITC district	0%
Number of responses	2	Percent employed	100%	Range of yearly salary	~*
Number available for employment	2	Employed in related field	1	Average yearly salary	~*

*Range of yearly salary and average yearly salary not available. For the latest Occupational Outlook Handbook, which includes working conditions, employment, and earnings for careers in Heating, Air-conditioning, and Refrigeration Mechanic and Installer occupations, visit the U.S. Department of Labor Web site: <http://www.bls.gov/oco/ocos192.htm>.