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.

Special Feature

This program is unique in the state. The HVAC/R program at Wisconsin Indianhead Technical College has adopted new certification guidelines established by The National Coalition of Certifications (NC3), working with Trane, a leader in the HVAC/R industry.

NC3 was established to address the need for strong industry partnerships with educational institutions in order to develop, implement, and sustain industry-recognized certifications that have strong validation and assessment standards.

NC3 has developed a comprehensive, workforce development program for training and professional certifications. NC3 members are provided with expert consultation – from facility planning, faculty training, and the support necessary for professional certification programs.

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)
- Review and sign the Functional Ability Statement of Understanding
- Complete admissions meeting with a WITC counselor (above requirements should be completed prior to meeting)

Program Outcomes

Employers will expect graduates of this program to be able to:

- Install HVAC/R components
- Service HVAC/R systems
- Troubleshoot HVAC/R systems
- Evaluate HVAC/R system designs

Employability essentials and indicators will also be addressed to develop personal awareness, career effectiveness, and professionalism. See page 5 of the college catalog for a list of employability essentials 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

<table>
<thead>
<tr>
<th>Number</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>10480105</td>
<td>Alternative Energy Overview</td>
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<tr>
<td>32601300</td>
<td>Air Conditioning Fundamentals</td>
<td>2</td>
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<tr>
<td>32601301</td>
<td>Basic Mechanical Fundamentals</td>
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<td>32601302</td>
<td>Refrigeration Fundamentals</td>
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<tr>
<td>32601303</td>
<td>Principles of AC/DC</td>
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<tr>
<td>32601304</td>
<td>Heating Systems</td>
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<td>32601305</td>
<td>Electrical Controls and Systems</td>
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<tr>
<td>32601306</td>
<td>HVAC/R Print Reading</td>
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<tr>
<td>32601307</td>
<td>Heating System Applications</td>
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<td>32601308</td>
<td>Electronic Energy Management</td>
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<tr>
<td>32601309</td>
<td>Control Circuit Applications</td>
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<tr>
<td>32601310</td>
<td>Sheet Metal Fabrication</td>
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<td>32601311</td>
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<td>Refrigeration Applications</td>
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<td>32601313</td>
<td>HVAC/R Electronic Troubleshooting/Repair (WBL)</td>
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<td>32601314</td>
<td>Heat Load Estimation</td>
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<td>32601315</td>
<td>Geothermal Systems</td>
<td>2</td>
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<tr>
<td>32890305</td>
<td>Applied Information Resources</td>
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<td>32809371</td>
<td>Applied Human Relations</td>
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PROGRAM REQUIREMENTS

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- Requires a prerequisite and/or corequisite that must be completed with a grade point of 2.0 or better.
- See pages 41-43 for course descriptions.
- NC3 Certification Exam Administered.

Campus:

Superior
Programs and 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, 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: 32602355 Math 155.

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 AC/R 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
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 commercial 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, basic, 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/gainful-employment/Gedt.html. 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 2014-2015; for most recent data, go to witc.edu)

<table>
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<tr>
<th>Number available for employment</th>
<th>Employed in related field</th>
<th>% employed in WITC district</th>
<th>Range of yearly salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>7</td>
<td>70%</td>
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</tr>
<tr>
<td>11</td>
<td>11</td>
<td>100%</td>
<td>$37,606</td>
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</tbody>
</table>

Graduate Employment Information
(WITC Graduate Survey Responses 2014-2015; for most recent data, go to witc.edu)

Number of graduates: 12
Number of responses: 11
Number available for employment: 10