SUSTAINABLE HEATING AND COOLING TECHNICIAN

Program Code 10-483-1
2014-2015 Estimated Tuition and Fees: $10,835*
Median Salary Six Months After Graduation: mstc.edu/programsalaries

The Sustainable Heating and Cooling Technician program prepares technicians to design, install, operate, and maintain Heating, Ventilation, and Air Conditioning/Refrigeration (HVAC/R) systems in residential and commercial applications.

The program places a strong emphasis on the most modern and efficient techniques, such as solar thermal, geothermal, biomass, radiant, and low temperature heat delivery systems, and high efficiency furnaces and boilers. Students will gain hands on experience in the installation of both traditional HVAC/R systems and this cutting edge equipment.

The Sustainable Heating and Cooling Technician program is offered at Wisconsin Rapids Campus.

* Includes tuition and materials/activity fees; books and other fees not included. For more details, go to mstc.edu/payingforcollege

PROGRAM OUTCOMES

Employers will expect you, as a Sustainable Heating and Cooling Technician graduate, to be able to:

- Work safely with HVAC/R, solar thermal, geothermal and biomass systems
- Install solar thermal collectors
- Install geothermal heat pumps
- Install boilers and furnaces
- Install piping, pipe insulation, and pipe supports
- Install ductwork and ventilation components
- Install water heaters and solar storage tanks
- Install electrical control systems
- Analyze heating and cooling system performance
- Select and adapt a HVAC/R system design
- Configure heating and cooling system performance for optimum efficiency
- Conduct a renewable energy site assessment
- Perform a system checkout and inspection
- Estimate a heating and cooling load

CAREER OPTIONS

Controls Technician
Geothermal Installation, Maintenance, and Service Technician
Heat Load Estimator
HVAC/R Installation, Maintenance, and Service Technician
Pre-Apprentice/Laborer
Renewable Energy Site Assessor
Solar Thermal Installation, Maintenance, and Service Technician
Technical Sales Representative

POTENTIAL FOR ADVANCEMENT

Energy Analyst
Journeyperson: Plumber, Steamfitter
Master Technician
Project Development Engineers
Project Manager
System Designer

Potential advancement generally requires further education.

ADMISSIONS PROCEDURES

To apply to the Sustainable Heating and Cooling Technician program, please submit the following documents to the MSTC Admissions Office:

1. Complete an MSTC application form and return it with the $30 non-refundable application fee.
2. Complete the Accuplacer or ACT test. Minimum scores required:
   - Reading-Accuplacer score of 55
   - Sentence Skills-Accuplacer score of 60
   - Math-Accuplacer score of 34
   - ACT equivalents for above scores are acceptable.

   You may take the Accuplacer again if you did not meet the required scores. Additional options, including coursework and tutoring, are also available to assist you. Contact the Student Affairs Office on your local campus to learn about your options. To schedule an Accuplacer test, contact your local Campus Office.

   Written Communication, mathematics courses, and some science courses have placement requirements. Please refer to the course description section in the back of the catalog, listed under General Education, for course specific information.

3. Submit an official copy of all academic transcripts, including high school, college or university, and HSED/GED.

__________________________________________________________
Mid-State Technical College Admissions
500 32nd Street North
Wisconsin Rapids, WI 54494
### PROGRAM COURSE DESCRIPTIONS

**10103106 // 3 credits**  
**Microsoft Office-Introduction**  
Develops introductory skills in the Microsoft Office Suite (Word, Excel, Access, and PowerPoint) while reinforcing the students’ knowledge of computer concepts, file management, Internet, and MSTC student email usage through demonstrations and lab exercises. Students must possess basic keyboarding, mouse, and Windows skills. Students may develop these skills in Academic Success Center computer training prior to enrolling or while concurrently enrolled in the Microsoft Office-Introduction course.

**10462116 // 3 credits**  
**Metal Fabrication**  
An introduction to structural steel and plate fabrication, sheet metal fabrication, and basic electric arc and oxyacetylene welding. Fabrication techniques, metal selection, layout, cutting, bending, drilling, threading, and joining will be presented. Information will be presented to the student followed by lab activities to provide a hands-on experience. The emphasis will be placed on developing an understanding of the tools, techniques, safe work habits, and the application of metal fabrication skills.  
**Prerequisite:** Admission to Automotive Technician 324042, Diesel & Heavy Equipment Technician 324121, Industrial Mechanical Technician 104621, Instrumentation & Controls Engineering Technology 106054, Machine Tool Technician 324201, Solar Electric Technician 104822, Sustainable Heating & Cooling Technician 104831, or Welding 314421 programs.

**10480101 // 4 credits**  
**Intro to Renewable Energy Systems**  
In this course, students investigate the need for renewable energy systems and emerging careers in renewable energy. Students examine the basic design, function, cost, and other considerations associated with solar photovoltaic, solar thermal, wind, geothermal, and biomass renewable energy systems. Students will also explore energy efficiency and conservation methods.

### CURRICULUM

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<th>Term</th>
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<tr>
<td>10103106</td>
<td>Microsoft Office-Introduction 3</td>
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<td>10480101</td>
<td>Intro to Renewable Energy Systems 4</td>
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<tr>
<td>10483120</td>
<td>Heating &amp; Plumbing Fundamentals 2</td>
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<td>10483121</td>
<td>Piping Fundamentals 2</td>
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<td>10605105</td>
<td>Electrical Circuits I 3</td>
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<td>10605108</td>
<td>Intro to Electronics 2</td>
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<td>10804107</td>
<td>College Mathematics 3</td>
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<td>10462114</td>
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<td>10483110</td>
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<td>10483122</td>
<td>Ventilation, Cooling, &amp; Refrigeration Fundamentals 2</td>
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<td>10623106</td>
<td>Intro to AutoCAD 2</td>
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<td>10801136</td>
<td>English Composition I-or-</td>
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<td>Written Communication 3</td>
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<td>Oral/Interpersonal Communication-or-</td>
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<td>10481110</td>
<td>Building Science, Performance, &amp; Evaluation 3</td>
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<td>10482101</td>
<td>Solar Site Assessment &amp; Evaluation 3</td>
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<td>10483111</td>
<td>Solar Heating System Design &amp; Installation 2 3</td>
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<td>10483130</td>
<td>HVACR Circuits &amp; Controls 3</td>
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<td>10809143</td>
<td>Microeconomics-or-</td>
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<td>10809144</td>
<td>Macroeconomics 3</td>
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<td>10809196</td>
<td>Intro to Sociology 3</td>
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<td>10483115</td>
<td>Heat Load Estimation &amp; Modeling 3</td>
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<td>10483131</td>
<td>HVACR Installation &amp; Service 2</td>
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<td>10483161</td>
<td>Advanced Renewable Thermal Systems 2</td>
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<tr>
<td>10605117</td>
<td>Programmable Logic Controllers - Beginning 3</td>
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<td>10806112</td>
<td>Principles of Sustainability 3</td>
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<td>10809122</td>
<td>Intro to American Government 3</td>
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**Total Credits 68-69**

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Please Note:

• The Sustainable Heating and Cooling Technician program has August and January start dates. We advise you to meet with an academic advisor or counselor to successfully plan your academic schedule.
• This curriculum sequence is only for student planning. Actual student schedules will vary depending on course availability.
• Degree completion time may vary based on student scheduling and course availability.
• For General Education course descriptions (800 level), see section marked under Course Descriptions.

10481110 // 3 credits
Building Science, Performance, & Evaluation
Students learn the tools and techniques use in the analysis of building shell integrity, focused on how to use an infrared camera to detect insulation, air, and water problems in a building, complemented by blower door testing. These concepts and skills are taught through extensive lab hours working directly with the tools of the trade. Students also investigate building ductwork leakage, building envelope tightness, and combustion efficiency.
Prerequisite: Construction Fundamentals 10482107.

10482101 // 3 credits
Solar Site Assessment & Evaluation
Students learn the steps to perform solar electric and solar water heating site assessments of a home or business. Class content covers solar window determination, load analysis, site selection, system types, system sizing and efficiency measures, and energy output estimation. The course also covers an overview of existing renewable electric incentive programs.
Prerequisite: Intro to Renewable Energy Systems 10480101.

10482107 // 2 credits
Construction Fundamentals
Students will study the concepts associated with the theory, materials, and methods used in construction to include footings and foundations, walls, floors, roofs and roof materials, exterior finishes, interior walls, ceiling and floor finishes, insulation types, vapor and air infiltration, and sound protection. Additionally, students will become familiar with blueprint reading and examine all the trades associated with construction, including electrical, HVAC, and plumbing. The safe use of the appropriate tools for each trade will also be covered.

10483110 // 3 credits
Solar Heating System Design & Installation 1
This course involves students in the installation and design of a solar hot water system. Topics include safety, system design and layout, component selection, mounting collectors, plumbing and insulating copper pipe, and installing a storage tank, heat exchanger, circulation pump, and other system components.
Prerequisite: Intro to Renewable Energy Systems 10480101.

10483111 // 3 credits
Solar Heating System Design & Evaluation 2
This course is a continuation of Solar Water Heating System Installation I and will focus on system integration and advanced installations. It also addresses solar space heating, solar pool heating, and solar cooling systems.
Prerequisite: Solar Heating System Design & Evaluation I 10483110.

10483115 // 3 credits
Heat Load Estimation & Modeling
This course teaches 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 estimate energy upgrades such as insulation and window improvements; and calculate payback and fuel savings.
Prerequisite: College Mathematics 10804107. Corequisite: Excel-Intermediate 10103124.
10483120 // 2 credits
Heating & Plumbing Fundamentals
Heating system 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. Plumbing system topics include fluid dynamics (pressure, resistance, and flow), basic system design, water heating, and operation of standard plumbing fixtures. 
Prerequisite: Admission to Renewable Energy Specialist 104823, Solar Electric Technician 104822, or Sustainable Heating & Cooling Technician 104831 programs.

10483121 // 2 credits
Piping Fundamentals
This course presents the theory of basic methods of plumbing and piping installation practices. Laboratory activities provide students with basic pipe joining processes associated with the plumbing field.
Prerequisite: Intro to Renewable Thermal Systems 10483100.

10483122 // 2 credits
Ventilation, Cooling, and Refrigeration Fundamentals
Topics covered include air conditioning principles and terms, physical principles of air movement, air filtering and humidity, and methods of conditioning air for comfort and health. In addition, the proper use of psychrometers, dry bulb thermometers, hygrometers, and the reading and interpretation of psychrometric charts and scales are covered, along with ASHRAE and BPI ventilation standards for residential units. Descriptions of new products, and maintenance and operations for residential and commercial cooling systems, are also covered, emphasizing energy conservation and efficiency options for new and existing equipment.

10483130 // 3 credits
HVACR Circuits & Controls
Topics in this course include an introduction to AC/DC electricity and the physical laws that apply to electronic circuits. Direct Current (DC) covers basic definitions of voltage, current, and resistance and analysis of series and parallel resistive circuits. Alternating Current (AC) includes an introduction to AC generation, capacitors, inductors, and transformers and their applications in electronic circuits. Additional topics include control circuits, symbols, diagrams, protection devices, relays, thermostats, single-phase motors, control components, and troubleshooting ACR system wiring diagrams.
Prerequisite: Electrical Circuits I 10605105 or Intro to Electronics 10605108.

10483131 // 3 credits
HVACR Installation & Service
This course addresses residential and light commercial heating, cooling, and refrigeration systems. Emphasis is placed on the diversity of heating and cooling systems and how they operate. Students will participate in the installation of a variety of HVACR systems and will troubleshoot and service systems.
Prerequisite: Intro to Electronics 10605108.

10483161 // 2 credits
Advanced Renewable Thermal Systems
This course explores advanced designs of renewable thermal systems including geothermal, wood gasification boilers, hydronic cooling, and integrated systems. This course also includes a project based learning experience. Students will complete a capstone project of their choosing.
Prerequisite: Successful completion of 12 credits of Sustainable Heating & Cooling (483) coursework.

10605105 // 3 credits
Electrical Circuits I
An introduction to AC/DC electricity and the physical laws that apply to electronic circuits. Direct Current (DC) covers basic definitions of voltage, current, and resistance and analysis of series and parallel resistive circuits. Alternating Current (AC) includes an introduction to AC generation, capacitors, inductors, and transformers and their applications in electronic circuits. Approximately 50% of the course is spent in the laboratory applying the principles and theory presented in the classroom.
Prerequisite: Intermediate Algebra with Applications 10804118.

10605108 // 2 credits
Intro to Electronics
This course presents a survey of electricity and electronics which includes lab activities and is designed for persons wishing to learn some of the basics of electricity and electronics. It is an excellent refresher course to get back into electronics or improve a skills list. The course is intended for persons where electronics has become a part of their regular occupation and a need exists to identify various electronic components and perform basic tests using test equipment such as multimeters and oscilloscopes. The course covers concepts and applications of DC and AC electricity, semiconductor components, and digital devices using basic math skills.

10605117 // 3 credits
Programmable Logic Controllers-Beginning
An overview of programmable logic controllers (PLCs) which provides a foundation of knowledge of the programming techniques, operation, and maintenance of PLCs used in typical industrial automation.

10623106 // 2 credits
Intro to AutoCAD
This is an introductory course in computer aided drafting (CAD) using AutoCAD software. It provides foundation skills in using CAD software to create and print two dimensional technical drawings. This course is available to students in any program. Computer skills and prior knowledge of drawing/drafting techniques is recommended.