HVAC/R - HEATING, VENTILATION, AIR CONDITIONING AND REFRIGERATION

DIPLOMA – 35 CREDITS

About this program

Students in this program work with both residential and light commercial heating, ventilation, ducting, air conditioning and refrigeration equipment. This extensive background, together with hands-on skills in layout, fabrication, installation and repair, qualifies graduates to enter one of the world's fastest-growing industries. Employment exists with manufacturers, engineers, contractors and specialized service firms. Students learn and develop applications skills of more efficient, cost-effective equipment and their application procedures. Many new, exciting and energy-saving innovations are being developed. Technicians train in this industry to provide the latest technologies to control the environment in any enclosed area, from residential homes to light commercial buildings. This includes controlling indoor air quality by utilizing mechanical means to remove pollutants and maintain desired humidity and temperature settings.

Program outcomes

1. Exhibit safety practices and procedures.
2. Lay out and install ductwork.
3. Design and fabricate ductwork.
4. Perform HVAC system installation, maintenance and troubleshooting.
5. Demonstrate professionalism and related soft skills.
6. Lay out and wire electrical schematics.

Curriculum overview

Crds	Requirement type
35	Required courses
35	**Total**

Developmental courses note: A student may be required to enroll in developmental courses in reading, writing and math. A student's scores on the Accuplacer assessment will determine enrollment in developmental courses. The purpose of developmental courses is to prepare students for the demands of a college-level curriculum. *Credits may vary.*

Accreditation: Minnesota State Community and Technical College is accredited by the Higher Learning Commission, a regional accreditation agency recognized by the U.S. Department of Education. The Higher Learning Commission 230 South LaSalle Street, Suite 7-500 Chicago, IL 60604-1411 http://www.ncahigherlearningcommission.org Phone: 312.263.0456 / 800.621.7440

Curriculum requirement details

Required courses

Course	Crds
HVAC1102 - Duct Fitting Construction	3
HVAC1103 - Electricity for Heating, Ventilating and Air Conditioning	4
HVAC1104 - Heating, Ventilating and Air Conditioning Electrical Controls	3
HVAC1128 - Heating, Ventilating, and Air Conditioning Design and Installation	5
HVAC1224 - Gas and Oil Heating	3
HVAC2202 - Air Handling	2
HVAC2214 - Hot Water Heating	2
HVAC2221 - Heat Pump Theory and Operation	3
HVAC2290 - Heating, Ventilating, and Air Conditioning Internship	1
MATH1000 - Technical Mathematics	3
REFR1110 - Refrigeration, Air Conditioning and Heating Principles	3
REFR1112 - Refrigeration, Air Conditioning and Heating Lab	3

Other requirements or restricted electives

Course summaries

HVAC1102 - Duct Fitting Construction ..... ***(3 credits)***
Standard sheet metal fittings will be constructed in this class. Familiarity with sheet metal shop equipment and various tools will be gained through the layout and construction of sheet metal projects. All fittings in this class will be found in standard duct applications.

HVAC1103 - Electricity for Heating, Ventilating and Air Conditioning ..... ***(4 credits)***
This course explains DC and AC theory, beginning with mathematically solving and hooking up series DC circuits and advancing into solving and hooking up AC resistance in series, parallel and combination circuits. HVAC relays and contactors and furnace safety devices are studied and wired in the lab. There is a dual emphasis on reading and then hooking up and troubleshooting schematic drawings. Magnetism and the generation of AC transformers as applied to HVAC, inductors and inductance-resistance parallel and series combination circuits are solved using trigonometry. Capacitance is introduced and applied as a function in understanding AC motors.

HVAC1104 - Heating, Ventilating and Air Conditioning Electrical Controls ..... ***(3 credits)***
This course covers the wiring of typical heating and cooling circuits, as well as the installation of heating and air conditioning systems.

Prerequisites:

- HVAC1103

HVAC1128 - Heating, Ventilating, and Air Conditioning Design and Installation ..... ***(5 credits)***
This course includes an overview of various heating controls and appliances. Topics will include blueprints as applied to estimating heating and cooling loads; gas piping as installed in residential and light commercial jobs; safe heating, ventilating and air conditioning practices; various venting codes and requirements; and the sizing of furnaces, duct work and piping.

HVAC1224 - Gas and Oil Heating ..... ***(3 credits)***
This course covers residential gas and oil heating units, primarily forced air furnaces. Emphasis is on understanding the sequence of operation, proper adjustment, efficiency measurement and safety. This course also includes the diagnosis and repair of malfunctioning furnaces.

Prerequisites:

- HVAC1128

HVAC2202 - Air Handling ..... ***(2 credits)***
The dynamics of handling fluid masses of air will be studied. The focus will be on moving and replacing air at given velocities, quantities and temperatures.

HVAC2214 - Hot Water Heating ..... ***(2 credits)***
This course covers both hot water baseboard and in-floor heating, with emphasis on calculations involved in hydronic heating.

Prerequisites:

- HVAC1128

HVAC2221 - Heat Pump Theory and Operation ..... ***(3 credits)***
This course will cover the various methods by which mechanical processes are used to move heat from different sources into residential housing. Some attention to commercial methods will be offered. An example of this would be use of the compression cycle of refrigeration to extract heat from the outside air.

Prerequisites:

- HVAC1103

HVAC2290 - Heating, Ventilating, and Air Conditioning Internship ..... ***(1 credits)***
This course will add to the student's electrical knowledge regarding circuits and schematics.

MATH1000 - Technical Mathematics ..... ***(3 credits)***
This course presents basic mathematical topics as they are applied in a technical program. The course includes a review of basic mathematical operations and continues with the development of algebraic and trigonometric skills in a technical setting. Most concepts will be applied through course-specific problems. This course is not an MnTC Goal Area 4 mathematics course, nor does it prepare students for taking an MnTC Goal Area 4 mathematics course.

REFR1110 - Refrigeration, Air Conditioning and Heating Principles ..... ***(3 credits)***
This course covers refrigeration theory of domestic refrigeration and introduction theory to commercial refrigeration and residential heating and air conditioning equipment including controls and accessories.

Prerequisites:

- HVAC1128

REFR1112 - Refrigeration, Air Conditioning and Heating Lab ..... ***(3 credits)***
This course covers the operation and service procedures of domestic refrigeration and an introduction to residential heating and air conditioning and commercial refrigeration equipment.

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Program Plan — "Primary"

Locations: Moorhead,Wadena

1st Fall Term (18 credits)

Courses

Course	Crds
HVAC1102 - Duct Fitting Construction	3
HVAC1103 - Electricity for Heating, Ventilating and Air Conditioning	4
HVAC1128 - Heating, Ventilating, and Air Conditioning Design and Installation	5
HVAC2202 - Air Handling	2
HVAC2290 - Heating, Ventilating, and Air Conditioning Internship	1
MATH1000 - Technical Mathematics	3

1st Spring Term (17 credits)

Courses

Course	Crds
HVAC1104 - Heating, Ventilating and Air Conditioning Electrical Controls	3
HVAC1224 - Gas and Oil Heating	3
HVAC2214 - Hot Water Heating	2
HVAC2221 - Heat Pump Theory and Operation	3
REFR1110 - Refrigeration, Air Conditioning and Heating Principles	3
REFR1112 - Refrigeration, Air Conditioning and Heating Lab	3