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

DIPLOMA – 35 CREDITS

About this program

Students in this program will gain the skills and knowledge to service and maintain commercial refrigeration equipment, which includes walk-in coolers and freezers, grocery store coolers and ice-makers. Students will gain skills in layout, installation and repair. Employment opportunities exist with manufacturers, engineers, contractors and specialized service firms. Students learn to research and develop applications of more efficient, cost-effective equipment and procedures. The knowledge to design, install and maintain these special environments for people, products and perishables is essential today.

Program outcomes

1. Exhibit industry safety practices and procedures.
2. Troubleshoot and repair residential and commercial refrigeration appliances.
3. Qualify for refrigeration recovery, recycling and retrofitting certification.
4. Apply installation procedures for residential and commercial refrigeration and air conditioning systems.
5. Apply system evacuation and recharging procedures.
6. Apply soldering and brazing procedures and techniques.
7. Design and interpret electrical schematics and wiring diagrams.
8. Exhibit effective communication skills.
9. Demonstrate computer utilization skills.

Curriculum overview

Crds	Requirement type
32	Required courses
3	Restricted electives in 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

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Curriculum requirement details

Required courses

Course	Crds
REFR2202 - Commercial Refrigeration and Air Conditioning Principles	4
REFR2204 - Commercial Refrigeration and Air Conditioning Lab	3
REFR2206 - Commercial Electrical Principles	3
REFR2208 - Commercial Electrical Lab	3
REFR2211 - Advanced Refrigeration Principles	4
REFR2212 - Advanced Refrigeration Lab	3
REFR2213 - Advanced Electrical Theory	3
REFR2215 - Advanced Electrical Applications	3
REFR2216 - Refrigeration Internship	3
REFR2217 - Commercial Grocery Store Refrigeration	3

Other requirements or restricted electives

3 credits from one or more of these Courses:

Course title	Credits
COMM1120 - Introduction to Public Speaking	3
COMM1130 - Small Group Communication	3

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Course summaries

REFR2202 - Commercial Refrigeration and Air Conditioning Principles ..... ***(4 credits)***
This course covers the principles of basic heat theory and gas laws as they apply to refrigeration systems. The operation of commercial walk-in coolers and freezers, commercial ice machines, air conditioners and heat pumps will be discussed, along with accessory components and piping methods used to install and maintain these systems. Safety is emphasized.

Prerequisites:

- Completion of HVAC/R diploma.

REFR2204 - Commercial Refrigeration and Air Conditioning Lab ..... ***(3 credits)***
This course covers practical applications related to commercial refrigeration and air conditioning equipment. The commercial refrigeration and air conditioning lab learning experience includes sequence of operation, troubleshooting, repair, maintenance and installation. Safety is emphasized throughout the course.

Prerequisites:

- Completion of HVAC/R diploma.

REFR2206 - Commercial Electrical Principles ..... ***(3 credits)***
This course covers the fundamentals of electrical components used in commercial refrigeration and air conditioning equipment. Reading and understanding electrical schematics will be employed to comprehend the sequence of operation and aid in troubleshooting. Students also will develop their own wiring diagrams by applying Ohm's law and how it relates to series and parallel circuits. Safety is emphasized.

Prerequisites:

- Completion of HVAC/R diploma.

REFR2208 - Commercial Electrical Lab ..... ***(3 credits)***
This course covers the practical applications of electrical components used to operate commercial refrigeration and air conditioning equipment. Included are troubleshooting, repairing and installing electrical devices common in larger systems. Students will use schematics they have developed to build control systems to operate refrigeration and air conditioning systems. Safety is emphasized.

Prerequisites:

- Completion of HVAC/R diploma.

REFR2211 - Advanced Refrigeration Principles ..... ***(4 credits)***
This course prepares students for more advanced lab sessions on commercial refrigeration systems. Students need to have a very good understanding of commercial refrigeration and electrical systems. Safety is emphasized.

Prerequisites:

- Completion of HVAC/R diploma.

REFR2212 - Advanced Refrigeration Lab ..... ***(3 credits)***
This course gives students the opportunity to work on more complicated refrigeration systems through individual or paired groups on field trips, off-site meetings and hands-on projects. Safety is emphasized.

Prerequisites:

- Completion of HVAC/R diploma.

REFR2213 - Advanced Electrical Theory ..... ***(3 credits)***
This course covers the electrical principles and schematics used in commercial, industrial, hospital and supermarket refrigeration systems. Safety is emphasized.

Prerequisites:

- Completion of HVAC/R diploma.

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REFR2215 - Advanced Electrical Applications ..... ***(3 credits)***
This course covers the application of electrical principles used in commercial, industrial, hospital and supermarket refrigeration systems. Safety is emphasized.

Prerequisites:

- Completion of HVAC/R diploma.

REFR2216 - Refrigeration Internship ..... ***(3 credits)***
In this course, projects, reports and discussions are coordinated to relate to the student's employment situation, which must be in an approved refrigeration or air conditioning occupation. A training agreement and an evaluation are required of each student.

Prerequisites:

- Completion of HVAC/R diploma.

REFR2217 - Commercial Grocery Store Refrigeration ..... ***(3 credits)***
This course is designed to cover the refrigeration piping and oil return in a grocery store setting. Students will learn about case controllers and temperature controls.

Prerequisites:

- Completion of HVAC/R diploma.

COMM1120 - Introduction to Public Speaking ..... ***(3 credits)***
Meets MnTC Goal Area 1. This course clarifies the process of oral communication, clarifies the basic principles of public speaking and allows the student to increase the application of these principles while both speaking and listening.

COMM1130 - Small Group Communication ..... ***(3 credits)***
Meets MnTC Goal Areas 1 and 2. This course focuses on communication issues in small groups and the importance of small group work in business today. An emphasis will be placed on improving communication skills for successful teamwork, group cohesiveness and the responsibility to group goals and tasks. Students will be provided with opportunities to build their group communication skills through practice.

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Program Plan — "Primary"

Locations: Moorhead

1st Fall Term (16 credits)

Courses

Course	Crds
REFR2202 - Commercial Refrigeration and Air Conditioning Principles	4
REFR2204 - Commercial Refrigeration and Air Conditioning Lab	3
REFR2206 - Commercial Electrical Principles	3
REFR2208 - Commercial Electrical Lab	3
REFR2216 - Refrigeration Internship	3

1st Spring Term (19 credits)

Courses

Course	Crds
REFR2211 - Advanced Refrigeration Principles	4
REFR2212 - Advanced Refrigeration Lab	3
REFR2213 - Advanced Electrical Theory	3
REFR2215 - Advanced Electrical Applications	3
REFR2217 - Commercial Grocery Store Refrigeration	3

3 credits in one or more of the following:

COMM1120 - Introduction to Public Speaking	3
COMM1130 - Small Group Communication	3

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