

MERCER COUNTY COMMUNITY COLLEGE  
Business & STEM Division

Course Outline

HRA-205  
Course Number

Heavy Commercial Systems I

Credits 4

Class Hours 3

Laboratory Hours 3

TEXT:

Refrigeration & Air Conditioning Technology

Authors: Whitman, Johnson, Tomczyk

ISBN: 076680667-7

Publisher: Thomson Learning

Length of Semester-15 Weeks

Catalog Description:

Procedures for installation, operation and service of various types of rooftop heating-cooling equipment. Refrigeration system components selection, installation and service.

Prerequisite HRA-203

Co-requisite – None

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Latest Review: Spring 2019

## Course Objectives

This course is intended to provide the refrigeration technician with a more detailed understanding of controls, valves, motors, compressors and many related technical aspects of the commercial refrigeration and air conditioning field.

### UNIT 1 Rooftop HVAC Equipment (4 nights)

#### SPECIFIC OBJECTIVES

The student will be able to. ....

1. Describe and explain the operation of gas fired and oil fired burners used in furnaces of roof top HVAC equipment.
2. Become familiar with pilot burners and fuel ignition systems.
3. Design a fuel-piping layout and select the proper fuel pipe sizes for gas and oil fired systems.

### UNIT 2 Reading Electrical Symbols and Ladder Diagrams (4 nights)

#### SPECIFIC OBJECTIVES

The student will be able to.....

1. Explain the meaning of common symbols used in ladder diagrams of today's major HVAC manufacturers.
2. Read and understand the logic of ladder diagrams and schematics.
3. Use ladder diagrams as a means to analyze mechanical and electrical problems in a malfunctioning system.

### Unit 3 Electric Motors for Refrigeration and Air Conditioning Systems (3 nights)

#### SPECIFIC OBJECTIVES

The student will be able to. ....

1. Identify common types of motors and their various unique characteristics and uses.
2. Select the proper horsepower and speed required for individual applications.
3. Know how to test and troubleshoot motor starting and running problems.
4. Become familiar with motor protection devices and how to identify problems with these devices.
5. Identify various electrical service power supplies for residential and commercial buildings and become aware of their voltage and ampacity.

UNIT 4 Refrigeration Pressure Regulating Valves / Electronic Pressure Regulating Valves  
(3 nights)

SPECIFIC OBJECTIVES

The student will be able to.....

1. Identify and describe the selection, installation and adjustment of suction pressure regulating valves.
2. Know how to select, install and adjust valves that are designed to control the discharge pressure of refrigeration system.
3. Understand the function of a valve that reduces compressor capacity and thereby reduces system capacity.
4. To identify and understand the operation and adjustment of compressor unloaders.
5. Identify and understand step motor valves

UNIT 5 Multistage Compressors  
(2 nights)

SPECIFIC OBJECTIVES

The student will be able to.....

1. Identify the causes of compressor overheating and make repairs of changes to a refrigeration system to reduce compressor failures caused by overheating.
2. Understand the principles for two and three stage compressors and how and why to use these for low temperature applications.
3. Become familiar with liquid sub-cooling and recognize the benefits of additional efficiency that it provides.
4. Identify and describe the operation of a cascade refrigeration system.

UNIT 6 Refrigeration Heat Load Calculation  
(3 nights)

SPECIFIC OBJECTIVES

The student will be able to.....

1. Do refrigeration heat load calculations and subsequent sizing and selection of compressors, condensers, evaporators, and expansion valves.
2. Use a heat load calculation as a means to verify the required sizing and the possible overloading of an existing refrigeration system.

UNIT 7 Good Piping Practice  
(2 nights)

SPECIFIC OBJECTIVES

The student will be able to.....

1. Recognize a properly piped refrigeration system and be able to describe the necessity for good piping and the resulting return of oil to the compressor.
2. Become familiar with pipe sizing tables and charts in order to do a piping and sizing layout for the earlier heat load calculations.

UNIT 8 Air and Water Cooled Condensers  
(1-1/2 nights)

SPECIFIC OBJECTIVES

The student will be able to.....

1. Describe normal operating conditions and pressures.
2. Select the proper size condenser for a given application.
3. Make necessary corrections and adjustments to achieve efficient operation.
4. Become familiar with water-cooling tower operation and maintenance.

UNIT 9 Hot Gas Defrost Systems  
(1-1/2 nights)

SPECIFIC OBJECTIVES

The student will be able to.....

1. Identify various hot gas defrost methods and describe where each is used to its best advantage.

UNIT 10 Class Trip  
(1 night)

SPECIFIC OBJECTIVES

1. Survey commercial RHVAC equipment not available on the MCTS campus.
2. Apply classroom training and experience on functioning refrigeration equipment.

## INSTRUCTIONAL CONTENT AND METHODS FOR ALL THE PRECEDING UNITS

1. Manufacturers handouts will be used and reviewed whenever applicable.
2. Actual component parts will be used during lecture and discussion hours.
3. Wall charts and overhead transparencies will be used extensively as means of instruction.
4. Students will use survey and load calculations.
5. Textbook reading will be assigned.
6. Some refrigeration lab equipment will be used in conjunction with class lectures.
7. Slides and videos will be used during classroom lectures.

## EVALUATION

One written evaluation will be given after completion of each unit instruction.

## COURSE EVALUATION AND GRADING

While the exact procedure for grading will be up to the individual instructor, the following will apply:

1. A written final examination covering all material presented before he or she can complete the course.
2. Unit test and quizzes will be cumulatively evaluated.
3. Attendance and attitude will be evaluated.
4. Final grade will reflect the total of the above.