



COURSE OUTLINE

Course Number HRA 102	Course Title Principles of Refrigeration / Air Conditioning II	Credits 2
Hours: Lecture/Lab/Other 1 Lecture/2 Lab	Pre-requisite HRA 101	Implementation Semester & Year Spring 2022

Catalog description:

Fundamental operating principles of compressors, condensers, and evaporators. Specific topics include types of metering devices, general accessory configuration, and procedures for charging and evaluating systems.

General Education Category:

Not GenEd

Course coordinator:

Harry Bittner, 609-570-3751, bittnerh@mccc.edu

Required texts & Other materials:

Refrigeration & Air Conditioning Technology by Whitman, Johnson, Tomczyk, 5th Edition, Thompson Learning ISBN: 1-4018-3765-4.

Course Student Learning Outcomes (SLO):

Upon successful completion of this course the student will be able to:

1. Explain the fundamental ideas behind vapor compression as it applies to refrigeration and air conditioning systems. [ILG # 1, 3, 11; PLO # 1, 6, 10]
2. Identify types of compressors, condensers, metering devices and evaporators. [ILG # 4, 10]
3. Disassemble a compressor and identify its component parts. [ILG # 4, 10; PLO # 2]
4. Safely evacuate and recover refrigerant from refrigeration and air conditioning systems. [ILG # 4, 10, 11; PLO # 2]
5. Effectively troubleshoot refrigeration systems. [ILG # 4, 10, 11; PLO # 2, 3, 8]

Course-specific Institutional Learning Goals (ILG):

Institutional Learning Goal 1. Written and Oral Communication in English. Students will communicate effectively in both speech and writing.

Institutional Learning Goal 3. Science. Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.

Institutional Learning Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Institutional Learning Goal 10. Information Literacy: Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.

Institutional Learning Goal 11. Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Program Learning Outcomes for Heating, Refrigeration and Air Conditioning (PLO)

1. Explain the basic theories and fundamental principles of heat transfer.
2. Service, troubleshoot, and repair domestic and commercial refrigeration and air conditioning systems and components.
3. Use electrical and mechanical test equipment and metering devices.
6. Communicate effectively by oral, written, or graphic means.
8. Understand the laws of physics as they apply to the subject field.
10. Apply the fundamental laws of thermodynamics and the basic principles of heat flow as they apply to HRAC.

Units of study in detail – Unit Student Learning Outcomes:

Unit I **Compressors, Condensers, Liquid Receivers and Evaporators** [Supports Course SLO # 1, 2, 3]

Learning Objectives

The student will be able to:

1. Identify and explain differences between reciprocating, rotary, screw and scroll compressors and be familiar with the operation of each type.
2. Disassemble, identify parts and reassemble open and semi-hermetic compressors,
3. Identify various types of evaporators, condensers and liquid receivers.

Unit II **Metering Devices** [Supports Course SLOs # 5]

Learning Objectives

The student will be able to:

1. Install, identify and be familiar with the function of the capillary tube, automatic expansion valve and thermostatic expansion valve.
2. Recognize and explain the limitation of metering devices listed in item 1 above.
3. Disassemble and identify parts in the thermostatic expansion valve.
4. Utilize laboratory equipment to observe the operating characteristics of each type of metering device. Perform superheat adjustments to expansion valve operation.

Unit III Recovery, Evaluation and Charging [Supports Course SLOs # 1, 4, 5]

Learning Objectives

The student will be able to:

1. Identify and explain basic concepts of refrigeration system recovery, evaluation and charging procedures.
2. Explain the operation of a refrigeration recovery system and identify its components.
3. Explain the operation of a vacuum pump and charging cylinder.
4. Proceed through system recovery, evaluation and charging procedures for a refrigeration or air conditioning system.

Evaluation of student learning: [Evaluates SLOs # 1 - 5]

Students' achievement of the course objectives will be evaluated through the use of the following:

- Results of a comprehensive final exam.
- Test results (a minimum of two tests, other than the final examination).
- Quiz results.
- Laboratory Performance
 - A laboratory evaluation of each student's ability to perform basic tubing, fitting and tool identifications, and basic swaging, faring, soldering and brazing procedures will be performed.
 - A performance evaluation of leak detection procedures will be conducted utilizing various methods and fluid system components.
- Attendance.

Evaluation Tools	Percentage Of Grade
Quizzes, Unit Tests and Exam	25%
Laboratory Performance	25%
Attendance	50%
Total	100%