

MERCER COUNTY COMMUNITY COLLEGE
Business & STEM

Course Outline

HRA-101
Course Number

Principles of Refrigeration/A.C. I
Course Title

Credits-2

Class Hours –1

Laboratory Hours –2

TEXT:

Refrigeration & Air Conditioning Technology
4th Edition

Authors: Whitman, Johnson, Tomczyk

ISBN: 076680667-7

Publisher: Thompson Learning

Length of Semester-15 weeks

Catalog Description:

Fundamental principles of pressure and temperature relationships, heat transfer, and heating and cooling concepts. Leak detection, types of refrigerants, piping materials and connections.

Prerequisite –None

Co requisite –None

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Latest Review: **Spring 2019**

Course Objectives:

This introductory program course is intended to provide the student with the basic concepts of heat flow and the fundamental knowledge and skills necessary to assemble and disassemble various mechanical components.

The student will be able to:

1. Explain the various fundamental scientific principles involved in heat flow and heat transfer including pressure and temperature relationships.
2. Explain the difference between various types of refrigerants and determine the proper application of each.
3. Safely perform the mechanical tasks that are fundamental to a career in Refrigeration and Air Conditioning.

UNIT I (5 nights)-Pressure / temperature Relationships of Heat and Heat Flow
Specific Objectives:

The student will be able to:

1. Perform various pressure and temperature measurements in the system and relate to pressure temperature charts.
2. Explain the basic concepts of heat and heat flow in reference to comfort cooling and refrigerating.
3. Clearly define and explain the types of heat necessary to understand the air conditioning or refrigeration circuit.

Instructional Content and Methods:

1. Students will be given classroom exercises involving the reading of pressure and temperature measuring instruments. Temperature readings will be converted to absolute and Celsius scales.
2. Basic concepts of heat and heat flow will be covered in detail to include convection, conduction, radiation, latent heat, sensible heat, superheat and specific heat.
3. Overhead transparencies and related slides will be used. Appropriate hardware and instrumentation will be utilized during parts of instruction relating to temperature and pressure gauges.

Evaluation:

At least one written test will be administered covering this material.

Unit II (3 nights)-Refrigerant Use

Specific Objectives:

The student will be able to:

1. Explain the characteristics and application of the most common refrigerants used today and be able to recognize the chemical name of each.
2. Describe the different operating pressures of the common refrigerants.
3. Identify the type leak detection device to be used with each type of refrigerant and be able to utilize the devices to locate refrigerant leaks.

Instructional Content and Methods:

1. Students will use refrigerant charts to determine characteristics of each commonly used refrigerant. Instruction will be centered around the fluorocarbon components R-12 and R-22 and the fluorocarbon azeotrope R-502 due to their dominance in the industry. Theory presentations will include the use of visual aids and will be reinforced and applied to the laboratory.
2. Students in the laboratory will become familiar with the proper utilization of leak detection equipment and will do actual leak detection projects.

Evaluation:

A written and/or performance test will be given at a later date after the students have had time to reinforce this units' materials with lab performance tasks.

UNIT III (7 nights) – Mechanical Components and Related Skills

Specific Objectives:

The student will be able to:

1. Determine the types of materials, pipe fittings and tubing used with various refrigerants.
2. Extract various pipe, tubing material and fitting data from reference books, manuals, charts, etc.

3. Determine the types of joints which should be used for various applications and be able to safely and competently use the tools and equipment required to make them.
4. Select the proper solders and brazing materials to be used for various connections and perform the fundamental joining tasks that are basic to the industry.
5. Use the various leak detection devices and methods which are available and troubleshoot various fluid systems for leaks.

Instructional Content and Methods:

1. Students will be given classroom exercises in identifying tubing, fillings and joints using overhead transparencies, slides and manufacturers catalogues.
2. Basic concepts of brazing and soldering procedures will be covered in detail to include the use of silver solder, silver-lead and soft solders.
3. Laboratory instruction will include demonstration by the instructor of each type brazing and soldering procedure as well as mechanical connection instruction. Demonstrations will then be reinforced by student participation in a sequence of laboratory tasks.

Evaluation:

1. At least one written examination will be given covering lecture materials.
2. A laboratory evaluation of each student's ability to perform basic tubing, fitting and tool identifications, and basic swaging, flaring, soldering and brazing procedures will be performed.
3. A performance evaluation of leak detection procedures will be conducted utilizing various methods and fluid system components.

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 in the course before he/she can successfully complete the course.
2. Final grade will be determined by evaluating final examination results, test results (a minimum of two tests, other than the final examination, will be given), laboratory performance and attendance.
3. Extra credit work will generally not be considered recognized in evaluating student performance, however, individual instructors do have limited flexibility and maneuverability in recognizing additional effort and performance by an individual student.