



MERCER
COUNTY COMMUNITY COLLEGE

COURSE OUTLINE

| Course Number | Course Title | Credits |
|-----------------------------|--------------------------------------|-----------------------------------|
| HRA 104 | Domestic Refrigeration – A/C Systems | 4 |
| Hours: Lecture/Lab/Other | Pre-requisite | Implementation Semester & Year |
| 2 Lecture/4 Lab | HRA 103 | Spring 2022 |

Catalog description:

Operating fundamentals for the diagnosis and repair of various domestic heating and cooling units including window and central units, refrigerators, freezers, gas furnaces, and heat pumps.

General Education Category:

Not GenEd

Course coordinator:

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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. Describe the operation of domestic refrigerators, freezers, room air conditioners and dehumidifiers. [ILG # 1, 3; PLO # 6, 8]
2. Service and repair basic domestic refrigerators, freezers, room air conditioners and dehumidifiers. [ILG # 10, 11; PLO # 1, 2, 3, 8]
3. Describe the operation and application of residential central air conditioning and heat pump systems. [ILG # 1, 3; PLO # 6, 8]
4. Service and repair basic residential central air conditioning and heat pump systems. [ILG # 10, 11; PLO # 1, 2, 3, 8]
5. Service and repair control systems for domestic refrigeration and air conditioning systems. [ILG # 10, 11; PLO # 1, 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)

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.
4. Utilize a working knowledge of control circuitry, instrumentation and ladder diagram/schematic interpretation.
6. Communicate effectively by oral, written, or graphic means.
8. Understand the laws of physics as they apply to the subject field.

Units of study in detail – Unit Student Learning Outcomes:

Unit I Domestic Refrigerators and Freezers [Supports Course SLO # 1, 2, 5]

Learning Objectives

The student will be able to:

1. Explain the basic principles of operation of refrigerators and freezers.
2. Describe the various components of refrigerators and freezers and their function within the system.
3. Identify different cabinet configurations and construction methods.
4. Install, initially adjust and clean domestic refrigeration units.
5. Utilize meters and test equipment to diagnose system electrical and mechanical malfunctions.
6. Describe the operation of electrical controls in refrigerators and freezers.
7. Troubleshoot and correct common malfunctions of electrical control circuits in domestic units.
8. Describe the various types of defrost systems and their operation.
9. Maintain, service and repair basic mechanical components of domestic units.

Unit II Room Air Conditioners and Dehumidifiers [Supports Course SLOs # 1, 2, 5]

Learning Objectives

The student will be able to:

1. Explain basic operation of room air conditioners and dehumidifiers.
2. Describe various components of room air conditioners and dehumidifiers.
3. Identify the different types of cabinet configurations and construction methods.
4. Install, initially adjust and clean domestic window air conditioning units.
5. Utilize meters and test equipment to diagnose system electrical and mechanical malfunctions.
6. Describe the operation of control and electrical components used in room air conditioners and dehumidifiers.
7. Troubleshoot and correct common malfunctions of electrical control circuits in domestic units.
8. Maintain, service and repair basic mechanical components of domestic units.

Unit III Residential Central Air Conditioning and Heat Pump Systems [Supports Course SLOs # 3, 4, 5]

Learning Objectives

The student will be able to:

1. Explain the theory of operation of heat pump systems.
2. Describe the basic operating cycles of central air conditioning and heat pump systems.
3. Explain application considerations for both cooling and heat pump systems.
4. Install, troubleshoot and maintain residential air conditioning and heat pump systems.
5. Identify and describe the operation of various components of central cooling and heat pump units including defrost systems (heat pumps only).
6. Describe the various types of control systems used in cooling and heat pump units.
7. Utilize schematic wiring diagrams for troubleshooting and determining sequence of operation.
8. Explain the operation of residential thermostats used in conjunction with cooling and heat pump systems and their wiring patterns.
9. Utilize meters and test equipment to diagnose systems electrical and mechanical malfunctions.

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).
- Laboratory Performance
- Attendance.

| Evaluation Tools | Percentage Of Grade |
|-------------------------|----------------------------|
| Tests and Exam | 33.3% |
| Laboratory Performance | 33.3% |
| Attendance | 33.3% |
| Total | 100% |