



MERCER
COUNTY COMMUNITY COLLEGE

COURSE OUTLINE

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| Course Number HRA 203 | Course Title Light Commercial Systems II | Credits 2 |
| Hours: Lecture/Lab/Other 1 Lecture/2 Lab | Pre-requisite HRA 202 | Implementation Semester & Year Spring 2022 |

Catalog description:

Study of electromechanical light commercial system operation, diagnosis and repair, including piping configurations, defrost systems, pressure switches, and pressure regulators.

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 install, start up and maintain small commercial refrigeration systems, including being able to:

1. Draw a ladder diagram for a refrigeration electrical system. [ILG # 3, 10, 11; PLO # 4, 7, 8]
2. Troubleshoot the electrical and mechanical aspects of a refrigeration system using a ladder diagram. [ILG # 3, 4, 10, 11; PLO # 2, 3, 4, 7, 8]
3. Modify a ladder diagram to accept additional controls or to incorporate newer electronic controls. [ILG # 3, 4, 10, 11; PLO # 2, 3, 4, 7, 8]
4. Select, install, and set electro-mechanical and updated electronic controls and explain their operation. [ILG # 3, 4, 10, 11; PLO # 3, 4, 7, 8]

Course-specific Institutional Learning Goals (ILG):

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.
7. Produce basic mechanical drawings and sketches needed to communicate concepts and designs.
8. Understand the laws of physics as they apply to the subject field.

Units of study in detail – Unit Student Learning Outcomes:

Unit I Ladder Electrical Diagrams [Supports Course SLO # 1, 2]

Learning Objectives

The student will be able to:

1. Draw a ladder diagram of a freezer case system.
2. Describe the function of all the individual circuits in freezer case system ladder diagram.
3. Explain the function of all the controls and relays in each circuit.
4. Test and troubleshoot the operation of controls.
5. Use a voltmeter and ammeter to test the motors and control operations in a circuit and diagnose any existing problems.

Unit II Installation, Operations and Adjustment of System Components [Supports Course SLOs #3, 4]

Learning Objectives

The student will be able to:

1. Describe the operation and adjustment of time clocks, pressure controls, temperature controls, contactors, start relays, and capacitors.
2. Install and adjust a compressor oil pressure failure control, an electronic 3 phase voltage monitor control and electronics temperature controls.
3. Revise a ladder diagram to reflect system modifications.
4. Explain the importance of proper voltage to the operation of a motor and how low voltage adversely affects a motors operation.
5. Use voltage and amperage readings to access operating conditions of a motor.
6. Install a voltage boosting transformer.
7. Read and interpret device manufacturers documentation as needed.

Evaluation of student learning: [Evaluates SLOs # 1 - 4]

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% |