

Course Outline

HRA 103
Course Number

Refrigeration/Air Conditioning
Electrical Controls
Course Title

Credits 4

Class Hours 2

Laboratory 4

TEXT:

Refrigeration & Air Conditioning Technology
5th Edition

Authors: Whitman, Johnson, Tomczyk

ISBN: 1-4018-3765-4

Publisher: Thompson Learning

15 Weeks

Length of Semester

Catalog Description

Types of application of various electro-mechanical devices such as motors, contactors, overload devices, thermostats, controls, relays and the use of various types of test and metering equipment.

EET130
Prerequisite

None
Co-Requisite

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Latest Review: Spring 2019

Course Objectives

This course is intended to provide the student with the basic concepts of electrical controls necessary for a career in air conditioning and refrigeration.

The student will be able to

1. describe the fundamental principles of electrical motors and controls used in air conditioning and refrigeration units and systems.
2. safely perform the electrical tasks that are basic to a career in air conditioning and refrigeration. These tasks include the installation, problem detection, repair, replacement and/or adjustment of electrical related components and interconnecting circuitry.
3. describe the function of individual electro-mechanical components and explain how they interrelate when integrated into a refrigeration or air conditioning system.

UNIT I (7 nights)-Basic Electricity, Electric Circuits and Power Distribution

1. Electrical Theory
2. Voltage, current and resistance
3. Electric circuits
4. Electric meters
5. Voltage systems and power distribution

Specific Objectives:

The student will be able to....

1. explain the basic concepts of electrical theory
2. explain the basic concepts of voltage, current and resistance and how they interrelate in both basic and complex circuits.
3. explain the principles of single phase voltage and give the advantages and limitations of same.
4. explain the principles of three phase voltage and give the advantages and limitation of same.
5. describe and construct the wiring configuration of a typical three phase circuit.
6. draw diagrams reflecting different single and three phase wiring procedures which will result in various voltage ratings.

Instructional Content and Methods:

1. Basic concepts of electrical theory.
2. Overhead transparencies and related slides will be used.
3. Handouts covering lecture material will be distributed where applicable.
4. Students will use laboratory facilities to become familiar with basic electrical theory. Basic electrical circuits will be mounted on boards by the students and evaluated.

Evaluation:

1. At least one written examination will be given covering materials presented during the theory sessions.
2. A laboratory evaluation of student projects will be made.

UNIT II (8 nights)-Basic Electrical Motors and Components

1. Magnetism
2. Basic motor theory
3. Motor starting relays
4. Capacitors
5. Shaded pole motors
6. Splits phase motors
7. Three Phase motors
8. Compressor motors
9. Motor winding resistance
10. Motor overload protection devices

Specific Objectives:

1. explain the basic concepts of electric motor.
2. explain the principles of single phase motors and give the advantages and limitations of same.
3. explain the principles of three phase motor and give the advantages and limitations of same.
4. draw diagram reflecting different single and three phase motors.
5. Use various meters to test motor winding resistances to determine the electrical condition of the windings.

Instructional Content and Methods:

1. Basic concepts and types of motors and controls will be covered in detail.
2. Appropriate hardware will be used during parts of instruction relating to each type of motor.
3. Overhead transparencies and related slides will be uses.
4. Handouts covering lecture material will be distributed where applicable.
5. Students will use laboratory facilities to become familiar with motors.

Evaluation:

1. At least one written examination will be given covering materials presented during the theory sessions.
2. A laboratory evaluation of student projects will be made.

UNIT III (5 nights)-Power Circuits

1. Disconnects and starters
2. Contactors
3. Relays
4. Overloads

Specific Objectives:

The student will be able to....

1. explain the basic construction of power circuit control components.
2. explain the principles of operations of individual power circuit control components.
3. describe the individual function performed by the given power circuit control components.
4. explain how primary control components are integrated into the electrical circuits of air conditioning and refrigeration systems and describe how each interacts within the circuit.

Instructional Content and Methods:

1. Basic concepts of power circuit controls will be covered in detail.
2. Appropriate hardware will be used during parts of instruction relating to each control covered.
3. Overhead transparencies and related slides will be used.
4. Handouts covering theory material will be distributed where applicable.
5. Students will use laboratory facilities to become familiar with power circuit controls. Circuitry will be mounted on boards by the students and components will be included as they are introduced and explained by the instructor.

Evaluation:

1. At least one written examination will be given covering materials presented during the theory sessions.
2. A laboratory evaluation of student projects will be made.

UNIT IV (6 nights)-Primary Controls

1. Thermostats
2. Pressurestats
3. Humidistats
4. Control Transformers
5. Line voltage, low voltage, and electronic controls

Specific Objectives:

The student will be able to....

1. explain the basic construction and configuration of primary control components.
2. explain the principles of operations of individual primary control components.
3. describe the individual function performed by primary control components.
4. explain how primary control components are integrated into the electrical circuits of air conditioning and refrigeration systems and describe how each interacts within the circuit.

Instructional Content and Methods:

1. Basic concepts of primary controls will be covered in detail.
2. Appropriate hardware will be used during parts of instruction relating to each control covered.
3. Overhead transparencies and related slides will be used.
4. Handouts covering theory material will be distributed where applicable.
5. Students will use laboratory facilities to become familiar with power circuit controls. Circuitry will be mounted on boards by the students and components will be included as they are introduced and explained by the instructor.

Evaluation:

1. At least one written examination will be given covering materials presented during the theory sessions.
2. A laboratory evaluation of student projects will be made.

UNIT V (4 nights)-Secondary Controls

1. Solenoids
2. Time controls
3. Switches

Specific Objectives:

The student will be able to....

1. explain the basic construction of secondary control components.
2. explain the principles of operations of individual secondary control components.
3. describe the individual function performed by secondary control components.
4. explain how secondary control components are integrated into the electrical circuits of air conditioning and refrigeration systems and describe how each interacts within the circuit.

Instructional Content and Methods:

1. Basic concepts of secondary controls will be covered in detail.
2. Appropriate hardware will be used during parts of instruction relating to each control covered.
3. Overhead transparencies and related slides will be used.
4. Handouts covering theory material will be distributed where applicable.
5. Students will use laboratory facilities to become familiar with power circuit controls. Circuitry will be mounted on boards by the students and components will be included as they are introduced and explained by the instructor.

Evaluation:

1. At least one written examination will be given covering materials presented during the theory sessions.
2. A laboratory evaluation of student projects will be made.