

COURSE OUTLINE

Basic Air-conditioning, Maintenance and Repair
COURSE TITLE

AC110
Dept. & Course No.

I. COURSE DESCRIPTION:

This course covers the basic practical skills/competencies needed on the worksite for the installation, maintenance and repair of air conditioning unitary systems.

II. SEMESTER CREDITS: 2

III. CONTACT HOURS PER WEEK: 1 1 2
LECTURE LAB TOTAL

IV. PRE-REQUISITES: None

V. STUDENT LEARNING OUTCOMES:

Upon completion of the course, the student will be able, with 65% accuracy to:

1. Describe the early development of refrigeration
2. Discuss the basic physical, chemical, and engineering principles applicable to refrigeration
3. Define the basic refrigeration terms
4. Select the proper tools for servicing and maintaining domestic refrigerators

VI. COURSE CONTENT:

- A. Development of refrigeration.
 1. Brief historical sketch of "man-made" cold
 2. Early experiments with food preservation
- B. How a mechanical refrigeration operate
 1. Heat
 2. Heat flow
 3. Cold
- C. Refrigeration Cycle
 1. Motor compressor
 2. Condenser
 3. Metering device
 4. Evaporator
 5. Connecting Tubing
- D. Basic hand tools for Refrigeration service

- | | | |
|---|--|--|
| | | <ol style="list-style-type: none"> 1. Names and uses of refrigeration tools 2. Proper care of tools |
| 5. Use and maintain gauges | E. Instruments and gauges | <ol style="list-style-type: none"> 1. Pressure gauges 2. Compound gauges 3. Components of manifolds sets 4. Rules for care of gauges |
| 6. Use calibrate and maintain multimeters | F. Multimeters | <ol style="list-style-type: none"> 1. VOM testers 2. Clamp ammeter 3. Watt meter 4. Proper care of testers |
| 7. Identify the common types of electrical components used in air conditioning. | G. Electrical Components | <ol style="list-style-type: none"> 1. Window-Type AC 2. Split-type AC |
| 8. Lists rules for working safely | H. Safety | <ol style="list-style-type: none"> 1. Terms associated with safety and correct definitions |
| 9. Cut an fit tubing using approved methods | I. Tubing operations | <ol style="list-style-type: none"> 1. Measurement and cutting tubing 2. Bending tubing
Connecting tubing |
| 10. Demonstrate soldering and brazing techniques | J. Steps for setting up oxyacetylene torch | <ol style="list-style-type: none"> 1. Soldering tubing 2. Brazing tubing 3. Testing soldered or brazed tubing for leaks 4. Leak repair |
| 11. Properly install and service Servicing split-unit | K. Installing window air conditioners and split-type units | and Window Units and type |

12. List common external service operations.

L. Trouble Shooting Chart

1. Start a Stuck-up Motor Compressor
2. Proper use of Piercing Valve
3. Methods and Equipment use For checking Electrical Parts.

VII. EQUIPMENT AND MATERIALS:

- A. Refrigeration Basic Hand Tools
- B. Refrigeration and AC units which uses Refrigerant number 11, 12, 22, 134a, 500 and 502
- C. Programmable Weighing Scale
- D. DOT approve Cylinders
- E. Refrigerant Recovery Station
- F. Ultrasonic Leak Detector
- G. Portable Refrigerant Recovery and Recycling Unit
- H. Refrigerant Recovery Equipment Designed for Automotive AC
- I. Electronic Thermometer
 1. Glass Stem Thermometer with range form 40 to 210 'F and 40 to 100 Celsius
 2. Kelvin and Rankine Thermometer
- J. Tape Rule: US standard and Standard International
- K. Pressure Gauge
- L. Compound Gauge
- M. Fundamentals of Refrigeration Trainer
- N. Microcomputer with Dvd Player
- O. Electronic Vacuum Gauge
- P. Bourdon Spring Gauge
- Q. Air Conditioners
- R. Air Conditioning Simulator
- S. Refrigeration Simulator
- T. Routine Classroom Materials
- U. Assorted fittings
- V. ACR tubings
- w. Refrigerants. 12, 22, 134a
- X. Evaporator repair kit
- Y. Oxy acetylene welding equipment
- Z. Brazing rods; silver, bronze
- AA. Abrasives
- BB. Cleaning solvents

- CC. Machine bolts and cap screws
- DD. Refrigeration oil

VIII. TEXT AND REFERENCES:

A. TEXT:

Althouse, A.D., et al. Modern Refrigeration and Air Conditioning. South Holland, ILL.: Goodhearted Wilcox Publishing Company, Inc., 2004.

~~B. REFERENCES:~~

~~Miller, Rex. Rex. Refrigeration and Air Conditioning Technology. Peoria, ILL.: Benett and Meknight Publishing Company, 1990.~~

~~Warren, Marsh and Olivo, C.T. Principles of refrigeration. Albany, New York: Delmar Publishers 1985.~~

~~Kamp, J.L. Refrigeration and Air Conditioning Laboratory Manual. Toledo, Ohio: Thermal Engineering Co., 1980.~~

IX. METHOD OF INSTRUCTION:

- A. Lecture
- B. Discussion
- C. Demonstration
- D. Audio Visual
- E. Performance
- F. Field Trip

X. METHOD OF EVALUATION:

Components with corresponding weight in percent included in the computation of the final grades are:

Components	Weight
Participation 30%
Homework and Assignments 10%
Quizzes 15%
Mid Term Grade 20%
Final Exams 25%

	Total = 100%

The transmutation of total percent to letter grade is as follows:

Weight	Letter Grade
90 - 100%	A
80 - 89%	B
70 - 79%	C
65 - 69%	D
0 - 64%	F

**Course Level Achievement
Form A**

(Used for all shop courses as well as other program courses)

AC 110 - Basic Air-conditioning, Maintenance and Repair

Student Name: _____

Semester/Year: _____

Instructor's Name (Print): _____

Direction: Asses the student using the rating scale below and check the appropriate numbers to indicate the degree of competency. The numerical rating of 5,4,3,2,and 1 are not intended to represent the traditional school grading system of A,B,C,D and F. The description associated with each of the numbers focus on the level of student performance for each of the competencies listed below.

Rating Scale: 5 Excellent
 4 Above average
 3 Average
 2 Below average
 1 Unacceptable

- **Passing Achievement:** A student must achieve at least a numerical value level of 3 in all the course competencies in order to pass this course. Through weekly progress report, students who are barely passing or failing the course are referred to Counseling Services for assistance.

COMPETENCIES	RATINGS
A. Explain the principles of heat transfer and Refrigeration cycle.	5 4 3 2 1
B. Identify the various hand tools and select the proper tools for servicing and maintaining domestic refrigerators and air conditioners.	5 4 3 2 1
C. Cut, flare, swage, bend, solder and braze tubing using approved methods and techniques	5 4 3 2 1
D. Install window type units and split type units	5 4 3 2 1
E. Recognize trouble signals, determine the common causes, repair and test electrical control problems of domestic units using the correct power tools and materials.	5 4 3 2 1

I certify that the student has completed all the competencies in this program and has achieved an average rating as shown on the right.

Instructor's Signature

Date

AC110 - Basic Air-conditioning, Maintenance and Repair

A. Explain the principles of heat transfer and Refrigeration cycle.

- 5 Explain the principles of heat transfer and refrigeration cycle with 90-100% accuracy.
- 4 Explain the principles of heat transfer and refrigeration cycle with 80-89% accuracy.
- 3 Explain the principles of heat transfer and refrigeration cycle with 70-79% accuracy.
- 2 Explain the principles of heat transfer and refrigeration cycle with 65-69% accuracy.
- 1 Explain the principles of heat transfer and refrigeration cycle with below 65% accuracy.

B. Identify the various hand tools and select the proper tools for servicing and maintaining domestic refrigerators and air conditioners.

- 5 Identify the various hand tools and select the proper tools for servicing and maintaining domestic refrigerators and air conditioners with 90-100% accuracy.
- 4 Identify the various hand tools and select the proper tools for servicing and maintaining domestic refrigerators and air conditioners with 80-89% accuracy.
- 3 Identify the various hand tools and select the proper tools for servicing and maintaining domestic refrigerators and air conditioners with 70-79% accuracy.
- 2 Identify the various hand tools and select the proper tools for servicing and maintaining domestic refrigerators and air conditioners with 65-69% accuracy.
- 1 Identify the various hand tools and select the proper tools for servicing and maintaining domestic refrigerators and air conditioners with below 65% accuracy.

C. Cut, flare, swage, bend, solder and braze tubing using approved methods and techniques.

- 5 Cut, flare, swage, bend, solder and braze tubing using approved methods and techniques with 90-100% accuracy.
- 4 Cut, flare, swage, bend, solder and braze tubing using

approved methods and techniques with 80-89% accuracy.

- 3 Cut, flare, swage, bend, solder and braze tubing using approved methods and techniques with 70-79% accuracy.
- 2 Cut, flare, swage, bend, solder and braze tubing using approved methods and techniques with 65-69% accuracy
- 1 Cut, flare, swage, bend, solder and braze tubing using approved methods and techniques with below 65% accuracy.

D. Install window type units and split type units.

- 5 Install window type units and split type units with 90-100% accuracy.
4. Install window type units and split type units with 80-89% accuracy.
- 3 Install window type units and split type units with 70-79% accuracy.
- 2 Install window type units and split type units with 65-69% accuracy.
- 1 Install window type units and split type units with below 65% accuracy.

E. Recognize trouble signals, determine the common causes, repair and test electrical control problems of domestic units using the correct power tools and materials.

- 5 Identify, determine the causes, repair and test domestic units with electrical control problems using the correct power tools and materials with 90-100% accuracy.
- 4 Identify, determine the causes, repair and test domestic units with electrical control problems using the correct power tools and materials with 80-89% accuracy.
- 3 Identify, determine the causes, repair and test domestic units with electrical control problems using the correct power tools and materials with 70-79% accuracy.
2. Identify, determine the causes, repair and test domestic units with electrical control problems using the correct power tools and materials with 65-69% accuracy.
- 1 Identify, determine the causes, repair and test domestic units with electrical control problems using the correct power tools and materials with below 65% accuracy.

