

COURSE OUTLINE

REFRIGERANTS, DOMESTIC REFRIGERATORS AND FREEZERS

AC 211
Dept. & Course No.

Course Title

I. COURSE DESCRIPTION:

This course provides instruction in refrigerant protection, service and repair of refrigerators and freezers using the latest computer refrigeration simulator.

II. SEMESTER CREDITS: 3

III. CONTACT HOURS PER WEEK: $\frac{1}{(\text{Lecture})}$ $\frac{6}{(\text{Lab.})}$ $\frac{7}{(\text{Total})}$

IV. PREREQUISITE: AC 111 and AC 112

V. Student Learning Outcome:

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

1. Correctly classify and identify common refrigerants by their numbers.
2. List necessary properties of refrigerants.
3. Read pressure-temperature curve and diagrams.
4. Demonstrate handling of refrigerant cylinders and identify color code.

VI: COURSE CONTENT:

- A. Identifying Refrigerants by Number
- B. Requirements for Refrigerants
- C. Standard Evaporator Temperatures
 1. Use of Pressure Temperature Curve
 2. Use of Temperature Tables
- D. Refrigerant Cylinders
 1. Storage Cylinder
 2. Service Cylinder
 3. Returnable Cylinder
 4. Disposable Cylinder
 5. Color Code for Refrigerant Cylinder
 6. Safety procedures for Using Refrigerant Cylinders

Form CM-1
COURSE MODIFICATION PROPOSAL COVER PAGE

TYPE OF ACTION (Circle all that apply)

Revision in/of: 1. Credits 2. Title 3. Number 4. Text
5. Prerequisite 6. Student Learning Outcome
7. Other (specify) 3 Year Update

OLD Identification

Course Number & Title: AC 211 - Refrigerant Domestic
Refrigerators and Freezers
Semester Credits: 3

NEW Identification

Course Number & Title: AC 211 - Refrigerants Domestic
Refrigerators And Freezers
Semester Credits: 3

Contact Hours Per Week: 1 6 7
Lecture Lab Total

Total Course Hours: 114

Course Description As It Will Appear in the Catalog:

This course provides instruction in refrigerant protection,
service and repair of refrigerators and freezers using the latest
computer refrigeration simulator. Pre: AC 111 and AC 112 (1
credit lec., 2 credits lab)

Proposed first offering: Fall 2009 - 2010
Semester School Year

Proposed by: Ramon C. Garcia

Date: 11/30/09

Endorsed by: Fruiteso TELLEI

Date: 11/30/09

Fruiteso TELLEI / Instructor / ET

Approvals:

[Signature]
Chairperson

12-02-09
Date

Committee on Programs & Curricula

[Signature]

Dean of Academic Affairs

12/9/09
Date

[Signature]
Vice President

12/9/09

Date

Education & Training

5. Discuss construction of domestic refrigerators and freezers.

6. Demonstrate how to repair damaged cabinet finishes.

7. Select proper tools and instruments needed for installation on servicing of domestic refrigerator small commercial system.

8. Service internal and external mechanism using proper tools and materials.

9. Recognize trouble signals.

10. List common external service operations.

E. Refrigerator and Freezer Construction

1. Insulation
2. Cabinets
3. Mechanisms

F. Repairing Finishes

G. Instrument, Tools and Supplies

H. Installing Refrigerator and Freezers

1. Uncrating
2. Locating Position
3. Electrical Supply
4. Ice Cube Maker
5. Starting a System

I. Location and Removal of Troubles

1. Temperature - Pressure Conditions
2. Trouble Signals
3. Ice on Evaporator
4. Moisture and Ice in the Cabinet Insulation

J. 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, 410A 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

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. Refrigeration and Air Conditioning Technology. Peoria, ILL.: Bennett and McKnight Publishing Company, 1990.

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

Kemp, 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 trips

X. METHOD OF EVALUATION:

Four criteria considered in evaluating projects and performance of operation are:

- A. Accuracy
- B. Techniques
- C. Appearance
- D. Completion

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

Participation.....	15%
Quizzes.....	10%
Mid term and Final exam	20%
Projects	55%
Total	100%

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

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

TASK LISTS

<u>TASK</u>	<u>TIME</u>
Student Learning Outcome No. 1	6 hrs.
1. Identify and label the cylinder with the correct type of refrigerant.	
Student Learning Outcome No. 5	20 hrs.
Perform exterior, interior and operational inspection on refrigerators and freezers.	
1. Complete domestic refrigerator operational analysis sheet.	
2. Replace any cover plates on unit to original position.	
3. Clean all work area and return equipment	
Student Learning Outcome No. 6	10 hrs.
1. Repair damage cabinet and finishes.	
Student Learning Outcome No. 8	15 hrs.
Install refrigerators and freezers.	
1. Uncrate a refrigerator and freezers.	
2. Locate the position of refrigerator or freezer.	
3. Install ice maker.	
4. Connect the power source.	
5. Start a refrigerator or freezer.	
Student Learning Outcome No. 9	15 hrs.
1. Record the pressure of the refrigerating system	
2. Record the temperature of the box at each location.	
3. Record the state of refrigerant at the identified location.	
Student Learning Outcome No. 10	30 hrs.
1. Disconnect the power to the unit.	
2. Identify the parts for the assigned unit, using the given form.	
3. Construct a "ladder type wiring diagram" of the assigned unit.	
4. Test electrical component.	
5. Install piercing valve.	
6. Start a stuck up motor compressor.	
7. Remove and replace defective parts.	
8. Evacuate the system.	
9. Charge the system with the correct type and amount of refrigerant.	
Total	96 hrs.

Course Level Achievement

Form A

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

AC 211 - Refrigerants, Domestic Refrigerators and Freezers

Student Name: _____

Semester/Year: _____

Instructor's Name (Print): _____

Directions: Asses the student using the rating scale below and check the appropriate numbers to indicate the degree of competency. The numerical ratings 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 descriptions 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. Correctly classify and identify different types of refrigerant using numbers and color code and demonstrate proper handling of refrigerant cylinders.	5 4 3 2 1
B. Install refrigerator by leveling the legs, checking door seals and gaskets and taking the temperature, pressure and current according to manufacturer's specifications by operating the unit under normal conditions.	5 4 3 2 1
C. Use refrigerator simulator to simulate, identify, service and repair refrigerator with mechanical faults commonly encountered in the field.	5 4 3 2 1
D. Use commercial refrigeration simulator to simulate, identify, service and repair freezer with mechanical faults commonly encountered in the field.	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

AC 211- Refrigerants, Domestic Refrigerators and Freezers

A. Correctly classify and identify different types of refrigerant using numbers and color code and demonstrate proper handling of refrigerant cylinders.

- 5 Demonstrate proper handling of different types of refrigerant cylinders, identify them using numbers and color code with 90-100% accuracy.
4. Demonstrate proper handling of different types of refrigerant cylinders, identify them using numbers and color code with 80-89% accuracy.
- 3 Demonstrate proper handling of different types of refrigerant cylinders, identify them using numbers and color code with 70-79% accuracy.
- 2 Demonstrate proper handling of different types of refrigerant cylinders, identifying them using numbers and color code with 65-69% accuracy.
- 1 Demonstrate proper handling of different types of refrigerant cylinders, identify them using numbers and color code with 65% accuracy.

B. Install refrigerator by leveling the legs, checking door seals and gaskets and taking the temperature, pressure and current according to manufacturer's specifications by operating the unit under normal conditions.

- 5 Correctly install the refrigerator and freezer with the legs properly installed and leveled, doors properly adjusted, pressures, temperatures and current taken and recorded according to manufacturer's specifications and standard with 90-100% accuracy.
- 4 Correctly install the refrigerator and freezer with the legs properly installed and leveled, doors properly adjusted, pressures, temperatures and current taken and recorded according to manufacturer's specifications and standard with 80-89% accuracy.
- 3 Correctly install the refrigerator and freezer with the legs properly installed and leveled, doors properly adjusted, pressures, temperatures and current taken and recorded according to manufacturer's specifications and standard with 70-79% accuracy.
- 2 Correctly install the refrigerator and freezer with the legs properly installed and leveled, doors properly adjusted, pressures, temperatures and current taken and recorded according to manufacturer's specifications and standard with 65-69%

accuracy.

- 1 Correctly install the refrigerator and freezer with the legs properly installed and leveled, doors properly adjusted, pressures, temperatures and current taken and recorded according to manufacturer's specifications and standard with below 65% accuracy.

C. Use refrigerator simulator to identify, service and repair procedures of refrigerator with mechanical faults commonly encountered in the field.

- 5 Simulate, identify, service, repair and test refrigerator with mechanical faults commonly encountered in the field with 90-100% accuracy.
- 4 Simulate, identify, service, repair and test refrigerator with mechanical faults commonly encountered in the field with 80-89% accuracy.
- 3 Simulate, identify, service, repair and test refrigerator with mechanical faults commonly encountered in the field with 70-79% accuracy.
- 2 Simulate, identify, and test refrigerator with mechanical faults commonly encountered in the field with 65-69% accuracy.
- 1 Simulate, identify, service, repair and test refrigerator with mechanical faults commonly encountered in the field with below 65% accuracy.

D. Use commercial refrigeration simulator to simulate, identify, service and repair procedures of freezer with mechanical faults commonly encountered in the field.

- 5 Simulate, identify, service, repair and test freezer with mechanical faults commonly encountered in the field with 90-100%.
- 4 Simulate, identify, service, repair and test freezer with mechanical faults commonly encountered in the field with 80-89% accuracy.
- 3 Simulate, identify, service, repair and test freezer with mechanical faults commonly encountered in the field with 70-79%.
- 2 Simulate, identify, service, repair and test freezer with mechanical faults commonly encountered in the field with 65-69%.
- 1 Simulate, identify, service, repair and test freezer with mechanical faults commonly encountered in the field 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.