

## COURSE OUTLINE

COMPRESSOR SYSTEM  
AND REFRIGERANT CONTROL

Course Title

AC 121  
Dept. & Course No.

I. COURSE DESCRIPTION:

This course provides instruction on the different thermal laws and functions of the different components of refrigeration.

II. SEMESTER CREDITS:   3  

III. CONTACT HOURS PER WEEK:       $\frac{2}{\text{( Lecture )}}$        $\frac{3}{\text{( Lab. )}}$        $\frac{5}{\text{( Total )}}$

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. State the five thermal laws relating to refrigeration.
  
2. List components of a refrigeration compression system.

VI. COURSE CONTENT:

- A. Laws of Refrigeration
  1. Compression Cycle
  2. Operation
  
- B. Component Parts of the Refrigeration System
  1. Motor Compressor
  2. Evaporator
  3. Accumulator
  4. Suction Line
  5. Low Side Filter Drier
  6. Service Valves
  7. Condenser
  8. Liquid Receiver
  9. Liquid Line Filter Drier
  10. Liquid Line
  11. Refrigerant Flow Control

3. Explain the operation of each

C. Component Parts

component part.

4. Trace the flow of refrigerant through a complete refrigeration system.
  5. Name the two types of motor control and discuss their operation and purpose.
  6. Describe the six principal types of refrigerant controls and their operation.
  7. Name five different types of motor compressor.
  8. Identify the internal parts of the compressor.
  9. Compare the various elements used on refrigerant control.
  10. Determine the proper size of
1. Uses
  2. Functions
- D. Refrigeration Cycle
- E. Types of Motor Controls
- F. Operation of Refrigerant Controls
1. Capillary Tube
  2. Automatic Expansion Valve ( AEV )
  3. Thermostatic Expansion Valve ( TEV )
  4. Low Side Float
  5. Thermal Electric Expansion Valve ( TEEXV )
  6. High Side Float ( HSF )
- G. Operation of Motor Compressor
1. Reciprocating ( Piston Cylinder )
  2. Rotary
  3. Screw Type
  4. Centrifugal
  5. Scroll
- H. Compressor Internal Parts
- I. Sensing Elements
1. Liquid Charged
  2. Liquid Cross Charged
  3. Gas Charged
  4. Gas Cross Charged
  5. Superheat
- J. Capillary Tube

capillary tube to be used for specific applications.

1. Capacity
2. Fittings
3. Variables of Capillary Tube Design

11. Define the purpose and function of solenoid valves.

K. Solenoid Valves

1. Suction Pressure Valve
2. One Check Valve

#### 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
- U. Assorted fittings
- V. ACR tubing's
- w. Refrigerants. 12, 22, 134a
- X. Evaporator repair kit
- Y. Oxy acetylene gas
- 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.: Good Heart Wilcox Publishing Co., 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.

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. Field trips
- F. Performance

X. METHOD OF EVALUATION:

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

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

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

<u>Components</u>	<u>Weight</u>
Participation .....	15%
Quizzes .....	10%
Mid Term and Final Exams...	20%
Projects.....	55%
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	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

## TASKS LIST

<u>Task</u>	<u>Time</u>
Student Learning Outcome Nos. 2,3,7 and 8	15 hrs
Dismantle and assemble different types of motor compressor.	
1. Reciprocating	
2. Rotary	
3. Screw type	
4. Centrifugal	
5. Scroll	
Student Learning Outcome Nos. 5, 6 , 9 and 10	24 hrs
Remove, inspect and install refrigerant controls.	
1. Capillary tube	
2. Automatic expansion valve	
3. Thermostatic expansion valve	
4. Thermal Electric control	
5. Low side float	
6. High side float.	
Student Learning Outcome No. 11	9 hrs
Remove and replace solenoid valves.	
1. Suction pressure switch	
2. Discharge pressure switch	
3. Oil pressure switch	
Total Hours	48 hrs.

**Course Level Achievement  
Form A  
( Used for shop courses as well as other program courses)**

AC 121- Compressor Systems and Refrigerant Control

**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. State five thermal laws relating to refrigeration and explain the compression cycle for domestic refrigerator.	5 4 3 2 1
B. Identify and explain the operation or each component of compression system and trace the flow of refrigerant through a complete refrigeration system.	5 4 3 2 1
C. Name the four different types of motor compressor, explain how it operates, identify the internal parts and replace motor compressor.	5 4 3 2 1
E. Explain the operation of the different types of refrigerant control, remove and replace each type.	5 4 3 2 1
E. Remove and replace solenoid valves of a compression system	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 121- Compressor Systems and Refrigerant Control

**A. State five thermal laws relating to refrigeration and explain the compression cycle for domestic refrigerator.**

- 5 State five thermal laws relating to refrigeration and explain the compression cycle for domestic refrigerator with 90-100% accuracy.
- 4 State five thermal laws relating to refrigeration and explain the compression cycle for domestic refrigerator with 80-89 % accuracy.
- 3 State five thermal laws relating to refrigeration and explain the compression cycle for domestic refrigerator with 70-79 % accuracy.
- 2 State five thermal laws relating to refrigeration and explain the compression cycle for domestic refrigerator with 65-69 % accuracy.
- 1 State five thermal laws relating to refrigeration and explain the compression cycle for domestic refrigerator with below 65% accuracy

**C Identify and explain the operation or each component of compression system and trace the flow of refrigerant through complete refrigeration system.**

- C Sketch the simple compression system and identify the refrigeration component parts, describe each function and using arrow through the system show the exact path the refrigerant will take with 90-100% accuracy.
- C Sketch the simple compression system and identify the refrigeration component parts, describe each function and using arrow through the system show the exact path the refrigerant will take with 80-89% accuracy.
- C Sketch the simple compression system and identify the refrigeration component parts, describe each function and using arrow through the system show the exact path the refrigerant will take with 70-79% accuracy.
- C Sketch the simple compression system and identify the refrigeration component parts, describe each function and using arrow through the system show the exact path the refrigerant will take with 65-69% accuracy.
- C Sketch the simple compression system and identify the refrigeration component parts, describe each function and using arrow through the system show the exact path the refrigerant will take at below 65% accuracy



**C. Name the four different types of motor compressor, explain how it operate, identify the internal parts and replace motor compressor**

- 5 Name the four different types of motor compressor, explain how it operate, identify the internal parts and replace motor compressor with 90-100% accuracy.
- 4 Name the four different types of motor compressor, explain how it operate, identify the internal parts and replace motor compressor with 80-89% accuracy.
- 3 Name the four different types of motor compressor, explain how it operate, identify the internal parts and replace motor compressor with 70-79% accuracy.
- 2 Name the four different types of motor compressor, explain how it operate, identify the internal parts and replace motor compressor with 65-69% accuracy.
- 1 Name the four different types of motor compressor, explain how it operate, identify the internal parts and replace motor compressor with below 65% accuracy.

**D. Explain the operation of the different types of refrigerant control, remove and replace each type.**

- 5 Explain the operation of the different types of refrigerant control, remove and replace each type with 90-100% accuracy.
- 4 Explain the operation of the different types of refrigerant control, remove and replace each type with 80 - 89% accuracy.
- 3 Explain the operation of the different types of refrigerant control, remove and replace each type with 70-79% accuracy.
- 2 Explain the operation of the different types of refrigerant control, remove and replace each type with 65-69% accuracy.
- 1 Explain the operation of the different types of refrigerant control, remove and replace each type with below 65% accuracy.

**E. Remove and replace solenoid valves of a compression system.**

- 5 Remove solenoid valve and check for electrical problem, needle and seat, install it in horizontal position with refrigerant line with 90-100% accuracy.
- 4 Remove solenoid valve and check for electrical problem, needle and seat, install it in horizontal position with refrigerant line with 80 - 89% accuracy.
- 3 Remove solenoid valve and check for electrical problem, needle and seat, install it in horizontal position with refrigerant line with 70-79% accuracy.
- 2 Remove solenoid valve and check for electrical problem, needle and seat, install it in horizontal position with refrigerant line with 65-69% accuracy.
- 1 Remove solenoid valve and check for electrical problem, needle and seat, install it in horizontal position with refrigerant line with below 65% accuracy.