

## Heating, Ventilation, and Air Conditioning (HVAC) Troubleshooting and Repair (DEMR 1323)



**Credit:** 3 semester credit hours (2 hours lecture, 4 hours lab)

**Prerequisite/Co-requisite:** None

### Course Description

Introduction to basic heating, ventilation and air conditioning theory, testing, and repair, Emphasis on refrigerant reclamation, safety procedures, specialized tools and repairs. Student must pass ASE Certification test upon completion of this course.

### Required Textbook and Materials

1. **Auto Heating and Air Conditioning**  
Chris Johanson. Goodheart - Willcox Company, Inc.  
ISBN 978-1-61960-763-7; 4<sup>th</sup> edition
2. **Auto Heating and Air Conditioning Workbook**  
Chris Johanson. Goodheart - Willcox Company, Inc.  
ISBN 978-1-6196-767-5; 4<sup>th</sup> edition
3. Notebook and 8.5" x 11" notebook paper
4. Blue and Black ink pens
5. Safety glasses and suitable work clothes

### Course Objectives

Upon completion of this course, the student will be able to:

1. Identify and use Heating and Air Conditioning Service specialty test equipment and basic mechanics hand tools.
2. Use human protection equipment.
3. Correctly use and dispose of environmentally sensitive and hazardous materials.

### Course Outline

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|--|--|
| A. Shop Orientation  | 2. MSDS  |
| 1. Lab policies  | 3. Disposal of waste material                        |
| 2. Tool room duties  | 4. Recovery of refrigerant                           |
| 3. Housekeeping assignment   | D. Tools and Shop Equipment                          |
| B. Shop Safety   | 1. Identify  |
| 1. General shop safety regulation                                      | 2. Use of tools properly                             |
| 2. Personal Safety   | E. Air Conditioning Service specialty test equipment |
| C. Proper handling of hazardous and environmentally sensitive material | 1. Thermometers                                      |
| 1. Classification  | 2. Gauge Manifolds                                   |
|  | 3. Vacuum Gauges                                     |
|  | 4. ECM Scan Equipment                                |
|  | F. Types of Pullers                                  |

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1. Arm pullers
2. Hub
3. Jacking Screw
4. Orifice extractors

G. Spring coupler release tools and shop equipment

1. Presses
2. Recovery / Recycle
3. Vacuum pump
4. Vises
5. Cleaning Equipment

H. Tubing and Fittings

1. Aluminum
2. Rubber

I. Unit

1. Testing and Charging
2. Connections and Circuits

J. General unit information

1. Use of manuals
2. Checking specification
3. General description
4. Model description
5. Unit serial, model, and optional plate numbers
6. General procedure for disassembly
7. Parts inspection
8. Use of tools for disassembly
9. Safety precautions

**Grade Scale**

90 – 100	=	A
80 – 89.9	=	B
70 – 79.9	=	C
60 – 69.9	=	D
0 – 59.9	=	F

**Course Evaluation**

Final grades will be calculated according to the following criteria:

Daily work, Quizzes and Homework assignment	1/3%
Major Test over Lectures and Chapters, plus one outside assignment	1/3%
<u>Final Exam</u>	<u>1/3%</u>
<b>Total</b>	<b>100%</b>

**Course Requirements**

1. Will take ASE Certification test at the end of semester.
2. Complete specific reading assignments in a timely manner specified by the instructor.
3. Seek out available material on the subject being taught, utilizing the library, periodicals and / or the Internet.
4. Wear sleeved shirts, full length jeans or work pants and preferably leather shoes to class and on campus. No shorts or tank tops are allowed.
5. Participate in project interview when offered.
6. Complete all work book and class assignments.
7. Be present at class sessions and examinations as scheduled.

### **Attendance Policy:**

1. Missing more than 20% of classes will result in an automatic “F” for the course.
2. Absences are counted for unexcused, excused and coming to class late.
3. Missing more than 20% of a class period will count as an absence.
4. Being tardy 3 times equals 1 absence.

If you wish to drop, you are responsible for the drop process. I will not initiate the drop, no matter how many absences or zeroes you have; that is, if you stop coming to class and do not drop, you will earn an F in the course.

***Students are allowed only 6 drops, from any public Institute of higher education, in their lifetime.***

### **Course Policies**

1. **No Cell Phone or Electronic Devices** allowed in class, unless it is known to the instructor, for a special reasoning.

***All cell phones must be turned off and put away. Text messaging during class time will not be tolerated. Text messaging during an exam will be considered academic dishonesty. The exam will be considered over and the student will receive a zero for the exam.***

2. **No smoking or use of any tobacco products** allowed
3. Do not bring any **food or drinks** in class
4. No visitor allowed in class including children
5. **Do not disturb lecture for any reason. If you must leave class or come in late, do so without disturbing class.**
6. **DRESS CODE:**

**Proper work attire only, NO *Open shoes, Short pants, low riding, or sleeveless shirts,* will be allowed in any program classrooms.**

7. **No grades will be dropped**, No homework or assignments can be made up or accepted after instructor has taken up for grading.
8. **Homework** must be done **in proper outline form, neat and legible**, prepared on **loose leaf (8.5” X 11”) note book paper**, written only on **one** side.
9. Assignment must be turn in at the beginning of class
10. Any student caught cheating will be dropped from class and given an F for the semester grade.
11. Students are required to be present for all examinations and lectures.
12. Learning activities will be subjectively graded by the instructor. Students assigned to a group must be present at all times when the project is being worked on.

**NOTE:**

**Students who violate any of these policies will be asked to leave class and given an absent for the class period. Students who are continuing disturbing classes will be suspended from class for the remainder of the semester and given an grade of F.**

*Students may vary in their competency levels on these abilities. You can expect to acquire these abilities only if you honor all course policies, attend classes regularly, complete all assigned work in good faith and on time, and meet all other course expectations of you as a student.*

**Disabilities Statement**

The Americans with Disabilities Act of 1992 and Section 504 of the Rehabilitation Act of 1973 are federal anti-discrimination statutes that provide comprehensive civil rights for persons with disabilities. Among other things, these statutes require that all students with documented disabilities be guaranteed a learning environment that provides for reasonable accommodations for their disabilities. If you believe you have a disability requiring an accommodation, please contact the Special Populations Coordinator at (409) 880-1737 or visit the office in Student Services, Cecil Beeson Building.

**Student Code of Conduct Statement**

It is the responsibility of all registered Lamar Institute of Technology students to access, read, understand and abide by all published policies, regulations, and procedures listed in the LIT Catalog and Student Handbook. The LIT Catalog and Student Handbook may be accessed at [www.lit.edu](http://www.lit.edu) or obtained in print upon request at the Student Services Office.

**Course Schedule**

<b>Week</b>	<b>Topic</b>	<b>Reference</b>
1	Lecture: Course introduction and policies	Auto heating and Air Conditioning
2	Lecture: Introduction to Automotive Heating, Air Conditioning, and Ventilation 1. A/C Components 2. HVAC Operation Test chapter 1	Chapter 1
3/4	Lecture: Shop Safety and Environmental Protection 1. Personal Safety Equipment 2. Environmental Test chapter 2	Chapter 2
5/6	Lecture: HVAC Tools, Equipment, and Service Information Lab: Preparing to Service a Vehicle	Chapter 3

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<b>Week</b>	<b>Topic</b>	<b>Reference</b>
	<ul style="list-style-type: none"> <li>• Perform Safety</li> <li>• Environmental Inspections</li> </ul> Test chapter 3	
7/8	Lecture: HVAC Electrical and Electronic Fundamentals Lab: <ul style="list-style-type: none"> <li>• Identify &amp; Interpret Vehicle Numbers</li> </ul> Test chapter 4	Chapter 4
9/10	Lecture: Principles of Refrigeration Lab: <ul style="list-style-type: none"> <li>• Find &amp; use Service Information</li> </ul> Test chapter 5	Chapters 5
11/12	Lecture: Refrigerants, Oils & Related Chemicals Lab: <ul style="list-style-type: none"> <li>• Use a Scan Tool to Retrieve Diagnostic Trouble Codes</li> </ul> Test chapter 6	Chapter 6
13	Lecture: Hoses, Lines, Fittings & Seals Lab: <ul style="list-style-type: none"> <li>• Diagnosing Heating, Air Conditioning Systems</li> </ul> Test chapter 7	Chapter 7
14/15/16	Final Project Servicing an Air Conditioning System ASE certification exam Final exam time announced	Instructor assigned Project

The course schedule is a proposed schedule. Changes in the schedule may be made based upon the instructor's professional judgment. If you are absent on a day in which changes to the schedule have been announced, it is your responsibility to find out those changes.

REV 5/25/17