

Lassen Community College Course Outline

AT-58 Automotive Heating and Air Conditioning

3.0 Units

I. Catalog Description

This course is designed to provide the student with theory and operation of common air conditioning and heating systems including diagnosis and repair and recovery of R-12, 134A, and R1234YF refrigerants. This course meets ASE Education Foundation standards. This course has been approved for hybrid and online delivery.

Recommended Preparation: Successful completion of ENGL105 or equivalent multiple measures placement.

34 Hours Lecture, 51 Hours Lab, 68 expected outside-of-class hours, 153 total student learning hours
Scheduled: Spring odd

II. Coding Information

Repeatability: Take 1 Time

Grading Option: Graded or Pass/No Pass

Credit Type: Credit - Degree Applicable

TOP Code: 094800

III. Course Objectives

A. Course Student Learning Outcomes

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

1. Diagnose, analyze, and repair air conditioning units and their components that use R-12, R-134A, and R1234YF refrigerants at a beginner level.
2. Diagnose, analyze, and repair common heating system malfunctions at a beginner level.
3. Demonstrate proper use of specialized tools and equipment when evacuating and charging a vehicle air conditioning system at a beginner level.

IV. Course Content

A. Safety and Heating and A/C systems basics

1. Shop safety and routines
2. Vehicle identifying information, customer concern, related service history, cause, and correction.
3. Identify and interpret heating and A/C system concern; determine necessary action.

B. A/C system components

1. Compressor and clutch assembly
2. Hoses
3. Condenser
4. Orifice tube/expansion valve
5. Evaporator core
6. Accumulator/receiver drier
7. Pressure switches and relief valves

C. Heat transfer methods

1. Radiation
2. Conduction
3. Convection
- D. Refrigerant identification**
 1. System identification
 2. R-12, R-134, RY1234, and blend refrigerant
 3. Identification process
 4. Sealant testing process
- E. System performance tests**
 1. Vent temperature
 2. High side pressure
 3. Low side pressure
- F. Evacuation, recycling, recovery, and recharge procedures**
 1. Refrigerant recovery
 2. Refrigerant recycling
 3. Bulk source charge
 4. Can source charge
 5. Oil charge
- G. Leak detection**
 1. Dye detection
 2. Electronic leak detector
- H. Component inspection and replacement**
 1. Clutch inspection, testing, and replacement
 2. Compressor replacement
 3. System flushing
 4. Condenser replacement
 5. Orifice tube/expansion valve replacement
 6. Evaporator core replacement
 7. Hose replacement
 8. Receiver drier/ accumulator
- I. R-12 to R-134 conversion**
 1. System repair
 2. System flushing procedure
 3. Proper oil usage
 4. High pressure cut-out switch installation
 5. Fitting installation
 6. System charge with proper refrigerant level.
- J. System controls**
 1. Automatic climate control
 2. Mechanical system controls
 3. Distribution controls
- K. Heater systems**
 1. Cooling system basics, theory of operation and component identification and testing
 2. Thermostat theory, testing and replacement
 3. Heater core inspection and replacement
 4. Hose and belt inspection and replacement

V. Assignments

A. Appropriate Readings

1. Manufacturer's bulletins
2. Various service manuals

B. Writing Assignments

Typical writing assignments will include:

1. Providing written answers to assigned questions
2. Performing mathematical calculations as assigned
3. Maintaining a notebook of class assignments/activities
4. Maintain a record of completed assignments/activities

C. Expected Outside Assignments

Appropriate outside assignments may include:

1. Researching appropriate readings
2. Preparing written assignments
3. Studying as needed for successful classroom performance

D. Specific Assignments that Demonstrate Critical Thinking

Students will perform analysis and evaluation of readings and/or classroom materials and utilize this analysis in classroom discussion, writing assignments, and in performing laboratory activities. Students must select and use appropriate methods and materials needed to complete laboratory assignments.

VI. Methods of Evaluation

Traditional classroom delivery:

Term paper (topic choice, thesis statement, outline, bibliography, rough draft, final draft), homework, classroom discussion, essay, journals, lab demonstrations and activities, multiple choice quizzes, and participation.

Hybrid Evaluation

All quizzes and exams will be administered during the in person class time. Students will be expected to complete online assignments and activities equivalent to in class assignments and activities for the online portion of the course. Electronic communication, both synchronous and asynchronous (chat/forum) will be evaluated for participation and to maintain effective communication between instructor and students.

Online Evaluation

A variety of methods will be used, such as: research papers, asynchronous and synchronous (chat/forum) discussions, online quizzes and exams, posting to online website and email communications using the districts approved learning management system.

VII. Methods of Delivery

Check those delivery methods for which, this course has been separately approved by the Curriculum/Academic Standards Committee.

Traditional Classroom Delivery Correspondence Delivery

Hybrid Delivery Online Delivery

Traditional Classroom Delivery:

The appropriate method of instruction will be determined by the instructor and may include:

1. Lecture with or without various audio/visual aids.
2. Group problem solving, discussion, debate, and/or critique.
3. Demonstration
4. Computer-assisted/other self-paced instruction.
5. Field trips or field assignments.
6. Laboratory assignments utilizing planned activities or 'live' work.

Hybrid Delivery:

Hybrid modality may involve face to face instruction mixed with online instruction. A minimum of 1/3 of instruction, including 100% labs, will be provided face to face. The remaining hours will be taught online through a technology platform as adopted by the district.

Online Delivery

A variety of methods will be used, such as: research papers, asynchronous and synchronous (chat/forum) discussions, online quizzes and exams, posting to online website and email communications using the districts approved learning management system.

VIII. Representative Texts and Supplies

Service manuals as determined by the instructor. Appropriate shop clothing, proper footwear, and safety glasses

Wagner and VanGelder; *Master Automotive Technician Series Automotive Heating, Ventilation and Air Conditioning*, 2018, Jones & Bartlett, ISBN 9781284119244

IX. Discipline/s Assignment

Automotive Technology

X. Course Status

Current Status: Active

Original Approval Date: 6/1/1990

Revised By: Chad Lewis

Curriculum/Academic Standards Committee Revision Date: 10/17/2023