

**Clackamas Community College**  
Online Course/Outline Submission System

---

Show changes since last approval in red              
  

**Section #1 General Course Information****Department:** Automotive Technology: Auto Mechanics**Submitter**

First Name: Rick  
Last Name: Lockwood  
Phone: 3053  
Email: rickl

---

**Course Prefix and Number:** AM - 224**# Credits:** 4**Contact hours**

Lecture (# of hours):  
Lec/lab (# of hours): 88  
Lab (# of hours):  
Total course hours: 88

For each credit, the student will be expected to spend, on average, 3 hours per week in combination of in-class and out-of-class activity.

---

**Course Title:** Comfort Systems**Course Description:**

This course covers design, construction, testing, maintenance, and repair of automotive heating and air conditioning systems. Prepares a student to take the Section 609 Environmental Protection Agency certification test.

---

**Type of Course:** Career Technical Preparatory

Is this class challengeable?

**Yes**

Can this course be repeated for credit in a degree?

**No**

Is general education certification being sought at this time?

**No**

Does this course map to any general education outcome(s)?

**No**

Is this course part of an AAS or related certificate of completion?

**Yes**

**Name of degree(s) and/or certificate(s):** Automotive Technology AAS

Are there prerequisites to this course?

**Yes**

**Pre-reqs:** MTH-020 or placement in MTH-050, pass WRD-080 or placement in WRD-090

**Have you consulted with the appropriate chair if the pre-req is in another program?**

**No**

Are there corequisites to this course?

**No**

Are there any requirements or recommendations for students taken this course?

**No**

Are there similar courses existing in other programs or disciplines at CCC?

**No**

Will this class use library resources?

**Yes**

**Have you talked with a librarian regarding that impact?**

**No**

Is there any other potential impact on another department?

**No**

Does this course belong on the Related Instruction list?

**No**

**GRADING METHOD:**

A-F or Pass/No Pass

**Audit: Yes**

When do you plan to offer this course?

✓ **Spring**

Is this course equivalent to another?

If yes, they must have the same description and outcomes.

**No**

Will this course appear in the college catalog?

**Yes**

Will this course appear in the schedule?

**Yes**

**Student Learning Outcomes:**

Upon successful completion of this course, students should be able to:

1. demonstrate how to diagnose and repair heating and air conditioning systems,
2. demonstrate proper recovery, evacuation, and recharging of modern day mobile air-conditioning systems;
3. summarize the function of each component in the heating and air conditioning system,
4. successfully obtain section 609 certification to handle today's refrigerant.

---

***This course does not include assessable General Education outcomes.***

---

**Major Topic Outline:**

1. Theory of operation
  - a. Heat movement
  - b. Handling refrigerant
  - c. Temperature - pressure relationship
  - d. Refrigerant safety precautions
  - e. Refrigerant oil
2. Basic system operation
  - a. Air conditioning systems
  - b. Heating systems
  - c. Engine cooling systems
3. System controls – air conditioning
  - a. Compressor controls
  - b. Evaporator controls
  - c. Condenser controls
4. Specific systems – air conditioning
  - a. Thermostatic switch device
  - b. Accumulator type
  - c. CCOT
  - d. FFOT
5. System service – air conditioning
  - a. Safety use of R-134a and YF-1234
  - b. Gauge use
  - c. Adding R-134a
  - d. Leak testing
  - e. System repair
  - f. Evacuation and recharging
6. Problem diagnosis – air conditioning
  - a. Low R-134a charges
  - b. Expansion valve stuck (closed/open)

- c. Restriction in high side
- d. Compressor malfunction
- e. Condenser malfunction
- f. Air and moisture in system
- g. CCOT/FFOT system diagnosis
- h. Related electrical components
- i. Related vacuum components
- 7. Compressor repair
  - a. Pulley bearing replacement
  - b. Clutch replacement
- 8. Heating System
  - a. Diagnosis and repair
- 9. Engine cooling system
  - a. Diagnosis and repair
- 10. Automatic temperature control systems
  - a. Vacuum control devices
  - b. Electronic control devices
  - c. Diagnosis and repair
- 11. Recycle and recovery systems
  - a. Single pass system
  - b. Multiple pass system

Does the content of this class relate to job skills in any of the following areas:

- |                                      |            |
|--------------------------------------|------------|
| 1. Increased energy efficiency       | <b>No</b>  |
| 2. Produce renewable energy          | <b>No</b>  |
| 3. Prevent environmental degradation | <b>Yes</b> |
| 4. Clean up natural environment      | <b>No</b>  |
| 5. Supports green services           | <b>Yes</b> |

Percent of course: 10%

First term to be offered:

**Next available term after approval**

: