

SYLLABUS

DIVISION: Business & Engineering Technologies

REVISED: Spring 2012

CURRICULA IN WHICH COURSE IS TAUGHT: Automotive Analysis and Repair

COURSE NUMBER/TITLE: AUT 236-01 Automotive Climate Control

**CREDIT HOURS: 4 HOURS/WEEK LECTURE: 3 HOURS/WEEK LAB: 3
LEC/LAB COMB: 6**

I. CATALOG DESCRIPTION:

Introduces principles of refrigeration, air conditioning controls, and adjustment and general servicing of automotive air conditioning systems.

II. RELATIONSHIP OF THE COURSE TO CURRICULA OBJECTIVES IN WHICH IT IS TAUGHT:
Students will:

- I. Demonstrate technical competencies and skills in heating and air conditioning systems.
- II. Demonstrate punctuality and reliability acceptable to the automotive repair industry.
- III. Demonstrate an understanding of the economic costs of automotive vehicle repair.
- IV. Use safety equipment and procedures required for the operations being performed.
- V. Read and interpret technical information required for projects and assignments.
- VI. Demonstrate and maintain a clean, orderly, safe and attractive work place and maintain a personal appearance that will enhance that work place.

III. REQUIRED BACKGROUND:

No previous courses required

Course textbook must be available for use and study

A basic hand tool set must be available and work clothes must be worn in lab

IV. COURSE CONTENT:

Automotive heater systems
Physics of heat and humidity
Principles of refrigeration
Refrigerants and safety procedures
Auto air conditioning design and systems
Air conditioning diagnosis
Component servicing
Servicing on the refrigeration system
Servicing on the distribution system
Servicing on the control system

Students will work to show competency in the performance of the following tasks:

ASE Task List

Heating & Air-conditioning

<i>Tasksheet</i>	<i>ASE Priority</i>	<i>ASE Task Number</i>	<i>Course Reference</i>
A. A/C system diagnosis & repair			
C341 Identify and interpret heating and air conditioning concern; determine necessary action.	P1	VII-A-1	AUT-236
C342 Research applicable vehicle and service information, such as heating and air conditioning system operation, vehicle service history, service precautions, and technical service bulletins.	P1	7A01	AUT-236
C343 Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals).	P1	7A02	AUT-236
C344 Performance test A/C system; diagnose A/C system malfunctions using principles of refrigeration.	P1	7A04	AUT-236
C345 Diagnose abnormal operating noises in the A/C system; determine necessary action.	P2	7A05	AUT-236
C346 Identify refrigerant type; conduct a performance test of the A/C system; determine necessary action.	P1	7A06	AUT-236
C347 Leak test A/C system; determine necessary action.	P1	7A07	AUT-236
C348 Inspect the condition of discharged oil; determine necessary action.	P2	7A08	AUT-236
C349 Determine recommended oil for system application.	P1	7A09	AUT-236
B. Refrigeration system component diagnosis & repair			
1. Compressor & clutch			
C350 Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action.	P2	7B101	AUT-236
C351 Inspect A/C compressor drive belts; determine necessary action.	P2	7B102	AUT-236
C352 Inspect, test, and/or replace A/C compressor clutch components and/or assembly.	P2	7B103	AUT-236

C353 Remove and reinstall A/C compressor and mountings; P1
measure oil quantity; determine necessary action.

7B104 **AUT-236**

2. Evaporator, condenser & related components

C354	Determine need for an additional A/C system filter; perform necessary action.	P3	7B201	AUT-236
C355	Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action.	P2	7B202	AUT-236
C356	Inspect A/C condenser for airflow restrictions; perform necessary action.	P1	7B203	AUT-236
C357	Remove and reinstall receiver/drier or accumulator/drier; measure oil quantity; determine necessary action.	P1	7B204	AUT-236
C358	Remove and install expansion valve or orifice (expansion) tube.	P2	7B205	AUT-236
C359	Inspect evaporator housing water drain; perform necessary action.	P3	7B206	AUT-236
C360	Remove and reinstall evaporator; measure oil quantity; determine necessary action.	P3	7B207	AUT-236
C361	Remove and reinstall condenser; measure oil quantity; determine necessary action.	P3	7B208	AUT-236

C. Heating, ventilation & engine cooling systems diagnosis & repair

C362	Diagnose temperature control problems in the heater/ventilation system; determine necessary action.	P2	7C01	AUT-236
C363	Perform cooling system, cap, and recovery system tests (pressure, combustion leakage, and temperature); determine necessary action.	P1	7C02	AUT-236
C364	Inspect engine cooling and heater system hoses and belts; perform necessary action.	P1	7C03	AUT-236
C365	Inspect, test, and replace thermostat and housing.	P1	7C04	AUT-236
C366	Determine coolant condition and coolant type for vehicle application; drain and recover coolant.	P1	7C05	AUT-236
C367	Flush system; refill system with recommended coolant; bleed system.	P1	7C06	AUT-236
C368	Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action.	P1	7C07	AUT-236
C369	Inspect and test electric cooling fan, fan control system and circuits; determine necessary action.	P1	7C08	AUT-236

C370 Inspect and test heater control valve(s); perform necessary action.

P2

7C09

AUT-236

C371 Remove and reinstall heater core.

P3

7C10

AUT-236

D. Operating systems & related controls diagnosis & repair

C372 Diagnose malfunctions in the electrical controls of heating, ventilation, and A/C (HVAC) systems; determine necessary action.	P2	7D01	AUT-236
C373 Inspect and test A/C-heater blower, motors, resistors, switches, relays, wiring, and protection devices; perform necessary action.	P1	7D02	AUT-236
C374 Test and diagnose A/C compressor clutch control systems; determine necessary action.	P1	7D03	AUT-236
C375 Diagnose malfunctions in the vacuum and mechanical components and controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action.	P2	7D04	AUT-236
C376 Inspect and test A/C-heater control panel assembly; determine necessary action.	P3	7D05	AUT-236
C377 Inspect and test A/C-heater control cables and linkages; perform necessary action.	P3	7D06	AUT-236
C378 Inspect A/C-heater ducts, doors, hoses, cabin filters and outlets; perform necessary action.	P3	7D07	AUT-236
C379 Check operation of automatic and semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action.	P3	7D08	AUT-236

E. Refrigerant recovery, recycling & handling

C380 Perform correct use and maintenance of refrigerant handling equipment.	P1	7.00E+01	AUT-236
C381 Identify (by label application or use of a refrigerant identifier) and recover A/C system refrigerant.	P1	7.00E+02	AUT-236
C382 Recycle refrigerant.	P1	7.00E+03	AUT-236
C383 Label and store refrigerant.	P1	7.00E+04	AUT-236
C384 Test recycled refrigerant for non-condensable gases. Evacuate and charge A/C system.	P1	7.00E+05	AUT-236 C385
	P1	7.00E+06	AUT-236

V. LEARNER OUTCOMES:

EVALUATED BY WRITTEN TESTS (Problem solving; short answer, multiple choice)

1. Identify the units in a basic heater system.
2. List the methods of heater temperature control.
3. Identify heater problems and correction methods.
4. List and identify the basic physics units of heat.
5. List refrigerants and properties.
6. Identify safety procedures required with refrigerants.

7. Identify components and operation of a basic refrigeration system.

8. Identify variations in refrigeration systems used in automotive air conditioning systems.
9. Identify the many types of temperature control methods used with automotive air conditioning systems.
10. Identify the problems causing system failures.
11. Identify procedures for proper recovery and recharging of different refrigerants.

VI. EVALUATION

BY LABORATORY PRACTICES (Shop instructor observation)

1. Replace heater hoses, cores and shop coolant leaks.
2. Diagnose and correct lack of sufficient heating.
3. Diagnose poor cooling by air conditioning system.
4. Diagnose and correct air circulation problems.
5. Test cooling properties and refrigerant leaks.
6. Replace faulty refrigerant components.
7. Recover and replace refrigerant in air conditioning system.
8. Practice proper safety procedures when using refrigerants.
9. 75% of students will be able to complete these assignments

VII. The Following General Education Objectives Will Be Addressed in This Course:

Communication

Learning Skills

Critical Thinking

Interpersonal Skills and Human Relations

Understanding Science and Technology