



AST 130 Heating and Air conditioning

Course Information

Division	ASET
Contact Hours	105
Theory	15
Lab Hours	90
Total Credits	4

Co requisites – AST 101

Course Description

This course focuses on automotive heating and air conditioning system theories, troubleshooting, and servicing. Proper refrigerant recovery, recycling, storage, and use of recharging equipment will also be covered. Students will be made aware of recent environmental concerns relevant to coolant and refrigeration. In addition, basic shop safety and safe use of recycling equipment will be discussed.

This course is a required core course for students pursuing a (n) Certificate or an *AAS in Automotive Technologies*

Program Outcomes Addressed by this Course:

Upon successful completion of this course, students should be able to meet the program outcomes listed below:

- A. Demonstrate the correct method of utilizing automotive service tools and equipment
- B. Identify all related system diagnostic/repair information within automotive service information
- C. Employ safe and professional work habits while conducting typical automotive service procedures.
- D. Explain how the various systems of an automobile work
- E. Demonstrate correct service procedures in the various automotive systems
- F. Test and diagnose the proper operation of the various automotive systems

Course Outcomes

In order to evidence success in this course, the students will be able to:

1. Understand and demonstrate general air conditioning system operation, diagnosis and repair

This outcome is relevant to program outcomes: (A) , (B),(C),(D), (E) and (F)

- a) Identify and interpret heating and air conditioning problems; determine necessary action.
- b) Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- c) Performance test A/C system; identify problems.
- d) Identify abnormal operating noises in the A/C system; determine necessary action.
- e) Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings.
- f) Leak test A/C system; determine necessary action.



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- g) Inspect condition of refrigerant oil removed from A/C system; determine necessary action.
- h) Determine recommended oil and oil capacity for system application.
- i) Using a scan tool, observe and record related HVAC data and trouble codes.

2. Understand and demonstrate refrigeration system component operation, diagnosis and repair

This outcome is relevant to program outcomes: (A) , (B),(C),(D), (E) and (F)

- a) Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action.
- b) Inspect, test, service or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed.
- c) Remove, inspect, and reinstall A/C compressor and mountings; determine recommended oil quantity.
- d) Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.
- e) Determine need for an additional A/C system filter; perform necessary action.
- f) Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action.
- g) Inspect A/C condenser for airflow restrictions; perform necessary action.
- h) Remove, inspect, and reinstall receiver/drier or accumulator/drier; determine recommended oil quantity.
- i) Remove, inspect, and install expansion valve or orifice (expansion) tube.
- j) Inspect evaporator housing water drain; perform necessary action.
- k) Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action.
- l) Determine procedure to remove and reinstall evaporator; determine required oil quantity.
- m) Remove, inspect, and reinstall condenser; determine required oil quantity.

3. Understand and Demonstrate heating, ventilation, and engine cooling system operation diagnosis and repair

This outcome is relevant to program outcomes: (A) , (B),(C),(D), (E) and (F)

- a) Inspect engine cooling and heater systems hoses; perform necessary action.
- b) Inspect and test heater control valve(s); perform necessary action.
- c) Diagnose temperature control problems in the heater/ventilation system; determine necessary action.
- d) Determine procedure to remove, inspect, and reinstall heater core.

4. Understand and demonstrate operating and control system operation, diagnosis and repair

This outcome is relevant to program outcomes: (A) , (B),(C),(D), (E) and (F)

- a) Inspect and test A/C-heater blower motors, resistors, switches, relays, wiring, and protection devices; perform necessary action.



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- b) Diagnose A/C compressor clutch control systems; determine necessary action.
- c) Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action.
- d) Inspect and test A/C-heater control panel assembly; determine necessary action.
- e) Inspect and test A/C-heater control cables, motors, and linkages; perform necessary action.
- f) Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action.
- g) Identify the source of A/C system odors.
- h) Check operation of automatic or semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action.

5. Understand and demonstrate proper methods of refrigerant recovery, recycling, and handling

This outcome is relevant to program outcomes: (A) , (B),(C),(D), (E) and (F)

- a) Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.
- b) Identify and recover A/C system refrigerant.
- c) Recycle, label, and store refrigerant.
- d) Evacuate and charge A/C system; add refrigerant oil as required.

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