BAKER COLLEGE
STUDENT LEARNING OUTCOMES

AST 2710A Heating, Ventilation, and Air Conditioning
4 Semester Hours

Student Learning Outcomes & Enabling Objectives

1. Demonstrate general A/C system diagnosis and repair techniques.
    a. Identify and interpret heating and air conditioning problems; determine needed action. (P1)
    b. Research vehicle service information including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins. (P-1)
    c. Performance test A/C system; identify problems. (P-1)
    d. Identify abnormal operating noises in the A/C system; determine needed action. (P-2)
    e. Identify refrigerant type; select and connect proper gauge set/test equipment; record temperature and pressure readings. (P-1)
    f. Leak test A/C system; determine needed action. (P-1)
    g. Inspect condition of refrigerant oil removed from A/C system; determine needed action. (P2)
    h. Determine recommended oil and oil capacity for system application. (P-1)
    i. Using a scan tool, observe and record related HVAC data and trouble codes. (P-3)

2. Demonstrate refrigeration system component diagnosis and repair techniques.
    a. Inspect, remove, and/or replace A/C compressor drive belts, pulleys, tensioners and visually inspect A/C components for signs of leaks; determine needed action. (P-1)
    b. Inspect, test, service and/or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed. (P-2)
    c. Remove, inspect, reinstall, and/or replace A/C compressor and mountings; determine recommended oil type and quantity. (P-2)
    d. Identify hybrid vehicle A/C system electrical circuits and service/safety precautions. (P-2)
    e. Determine need for an additional A/C system filter; perform needed action. (P-3)

f. Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform needed action. (P-2)
g. Inspect for proper A/C condenser airflow; determine needed action. (P-1)
h. Remove, inspect, and replace receiver/drier or accumulator/drier; determine recommended oil type and quantity. (P-2)
i. Remove, inspect, and install expansion valve or orifice (expansion) tube. (P-1)
j. Inspect evaporator housing water drain; perform needed action. (P-1)
k. Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and/or control module) to interrupt system operation; determine needed action. (P-2)
l. Determine procedure to remove and reinstall evaporator; determine required oil type and quantity. (P-2)
m. Remove, inspect, reinstall, and/or replace condenser; determine required oil type and quantity. (P-2)

3. Demonstrate heating, ventilation and engine cooling systems diagnosis and repair techniques.
    a. Inspect engine cooling and heater systems hoses and pipes; perform needed action. (P-1)
    b. Inspect and test heater control valve(s); perform needed action. (P-2)
    c. Diagnose temperature control problems in the HVAC system; determine needed action. (P2)
    d. Determine procedure to remove, inspect, reinstall, and/or replace heater core. (P-2)

4. Demonstrate operating systems and related controls diagnosis and repair techniques.
    a. Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action. (P-1)
    b. Diagnose A/C compressor clutch control systems; determine needed action. (P-2)
    c. Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine needed action. (P-2)
    d. Inspect and test HVAC system control panel assembly; determine needed action. (P-3)
    e. Inspect and test HVAC system control cables, motors, and linkages; perform needed action. (P-3)
    f. Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets; perform needed action. (P-1)
    g. Identify the source of HVAC system odors. (P-2)
    h. Check operation of automatic or semi-automatic HVAC control systems; determine needed action. (P-2)

5. Demonstrate refrigerant recovery, recycling, and handling procedures.
    a. Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards. (P-1)
    b. Identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required. (P-1)
    c. Recycle, label, and store refrigerant. (P-1)

6. Demonstrate body electrical systems diagnosis and repair.

    a. Diagnose operation of comfort and convenience accessories and related circuits (such as: power window, power seats, pedal height, power locks, truck locks, remote start, moon roof, sun roof, sun shade, remote keyless entry, voice activation, steering wheel controls, back-up camera, park assist, cruise control, and auto dimming headlamps); determine needed repairs. P-2

    b. Diagnose operation of safety systems and related circuits (such as: horn, airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, park assist, and back-up camera); determine needed repairs. P-1

7. Apply steering systems diagnosis and repair techniques to the supplemental restraint system (SRS).

    a. Disable and enable supplemental restraint systems (SRS); verify indicator lamp operation. P-1

    b. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (coil spring). P-1

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

Big Ideas

General A/C system diagnosis and repair
Refrigerant system components diagnosis and repair
Heating, ventilation and engine cooling system diagnosis and repair
Operating systems and related controls diagnosis and repair
Recovery and recycling of refrigerant
Body electrical systems diagnosis and repair
Supplemental restraint system diagnosis and repair

Essential Questions

1. How do you perform general air conditioning (AC) system diagnosis and repair?
2. How do you perform refrigerant system components diagnosis and repair?
3. How do you perform heating, ventilation and engine cooling system diagnosis and repair?
4. How do you perform operating systems and related controls diagnosis and repair?
5. How do you perform recovery and recycling of refrigerant?
6. How do you perform body electrical systems diagnosis and repair?
7. How do you perform supplemental restraint system diagnosis and repair?

These SLOs are not approved for experiential credit.

Effective: Fall 2023