

Minnesota State College Southeast

AUTO 1117: Auto Heating & Air Conditioning Lab

A. COURSE DESCRIPTION

Credits: 2

Lecture Hours/Week: *.*

Lab Hours/Week: 4

OJT Hours/Week: *.*

Prerequisites: None

Corequisites: None

MnTC Goals: None

In this course the student will perform heating and A/C service and maintenance. The student will perform troubleshooting techniques on heating and A/C systems including automatic temperature control systems. (Prerequisites: AUTO1105, AUTO1106, AUTO1207 or instructor approval) (2 Credits: 0 lecture/2 lab)

B. COURSE EFFECTIVE DATES: 04/27/1998 - Present

C. OUTLINE OF MAJOR CONTENT AREAS

1. Safety Requirements Strictly Enforced
2. A/C System Diagnosis and Repair
3. Refrigerating System Component Diagnosis and Repair - Compressor and Clutch
4. Refrigerating System Component Diagnosis and Repair - Evaporator, Condenser, and Related Components
5. Heating, Ventilation, and Engine Cooling systems Diagnosis and Repair
6. Operating Systems and Related Controls Diagnosis and Repair
7. Refrigerant Recovery, Recycling, and Handling

D. LEARNING OUTCOMES (General)

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.
2. Identify and interpret heating and air conditioning concern; determine necessary action. P-1
3. Research applicable vehicle and service information, such as heating and air conditioning system operation, vehicle service history, service precautions, and technical service bulletins. P-1
4. Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals). P-1
5. Performance test A/C system; diagnose A/C system malfunctions using principles of refrigeration. P-1
6. Diagnose abnormal operating noises in the A/C system; determine necessary action. P-2
7. Identify refrigerant type; conduct a performance test of the A/C system; determine necessary action. P-1
8. Leak test A/C system; determine necessary action. P-1
9. Inspect the condition of discharged oil; determine necessary action. P-2
10. Determine recommended oil for system application.
11. Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action. P-2
12. Inspect A/C compressor drive belts; determine necessary action. P-2
13. Remove and reinstall A/C compressor and mountings; measure oil quantity; determine necessary action. P-1
14. Determine need for an additional A/C system filter; perform necessary action. P-3
15. Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action. P-2
16. Inspect A/C condenser for airflow restrictions; perform necessary action. P-1
17. Remove and reinstall receiver/drier or accumulator/drier; measure oil quantity; determine necessary action. P-1
18. Remove and install expansion valve or orifice (expansion) tube. P-2
19. Inspect evaporator housing water drain; perform necessary action. P-3
20. Remove and reinstall evaporator; measure oil quantity; determine necessary action. P-3
21. Remove and reinstall condenser; measure oil quantity; determine necessary action. P-3
22. Diagnose temperature control problems in the heater/ventilation system; determine necessary action. P-2
23. Perform cooling system, cap, and recovery system tests (pressure, combustion leakage, and temperature); determine necessary action. P-1
24. Inspect engine cooling and heater system hoses and belts; perform necessary action. P-1
25. Inspect, test, and replace thermostat and housing. P-1
26. Determine coolant condition and coolant type for vehicle application; drain and recover coolant. P-1
27. Flush system; refill system with recommended coolant; bleed system. P-1
28. Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action. P-1
29. Inspect and test electric cooling fan, fan control system and circuits; determine necessary action. P-1
30. Inspect and test heater control valve(s); perform necessary action. P-2
31. Remove and reinstall heater core. P-3
32. Diagnose malfunctions in the electrical controls of heating, ventilation, and A/C (HVAC) systems; determine necessary action. P-2
33. Inspect and test A/C-heater blower, motors, resistors, switches, relays, wiring, and protection devices; perform necessary action. P-1
34. Test and diagnose A/C compressor clutch control systems; determine necessary action. P-1

35. Diagnose malfunctions in the vacuum and mechanical components and controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action. P-2
36. Inspect and test A/C-heater control panel assembly; perform necessary action. P-3
37. Inspect and test A/C-heater control cables and linkages; perform necessary action. P-3
38. Inspect A/C-heater ducts, doors, hoses, cabin filters and outlets; perform necessary action. P-3
39. Check operation of automatic and semi-automatic heating, ventilating, and air-conditioning (HVAC) control systems; determine necessary action. P-3
40. Perform correct use and maintenance of refrigerant handling equipment. P-1
41. Identify (by label application or use of a refrigerant identifier) and recover A/C system refrigerant. P-1
42. Recycle refrigerant. P-1
43. Label and store refrigerant. P-1
44. Test recycled refrigerant for non-condensable gases. P-1
45. Evacuate and charge A/C system. P-1
46. Exhibit professionalism

E. Minnesota Transfer Curriculum Goal Area(s) and Competencies

None

F. LEARNER OUTCOMES ASSESSMENT

As noted on course syllabus

G. SPECIAL INFORMATION

None noted