

JEFFERSON COLLEGE

COURSE SYLLABUS

AUT252

AUTOMOTIVE HEATING AND AIR CONDITIONING SYSTEMS LAB

3 Credit Hours

Prepared by: Gary Boyher
Date: February 10, 2014

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Date: September, 26 2016

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AUT252 Automotive Heating and Air Conditioning Systems Lab

I. CATALOGUE DESCRIPTION

- A. Pre-requisite: AUT221 Advanced Electrical/Electronics Systems with a Grade of “C” or Better
 AUT222 Advanced Electrical/Electronics Systems Lab with a Grade of “C” or Better
 Reading Proficiency Requirement
 Co-requisite: AUT251 Automotive Heating and Air Conditioning Systems
- B. 3 Credit Hours
- C. Automotive Heating and Air Conditioning Systems Lab involves the hands on diagnosis and repair of the heating systems, the mechanical refrigeration systems, and the electrical and vacuum control systems used on automobiles. Completion of this course will prepare the student for employment in the automotive field and take the National Institute for Automotive Service Excellence (ASE) Heating and Air Conditioning test (A7). (S)

II. EXPECTED LEARNING OUTCOMES/CORRESPONDING ASSESSMENT MEASURES

A. A/C System Diagnosis and Repair		
Demonstrate knowledge of completing a work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of identifying and interpreting heating and air conditioning concern; determine necessary action	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of researching applicable vehicle and service information, such as heating and air conditioning system operation, vehicle service history, service precautions, and technical service bulletins	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of locating and interpreting vehicle and major component identification numbers	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback

Demonstrate knowledge of performance testing an A/C system; identify A/C system malfunctions	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of identifying abnormal operating noises in the A/C system; determine necessary action	P-2	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of identifying refrigerant type; selecting and connecting proper gauge set; record temperature and pressure readings	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of leak testing A/C system; determine necessary action	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of inspecting the condition of refrigerant oil removed from the system; determine necessary action	P-2	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of determining recommended oil and oil capacity for system application	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of using a scan tool to observe and record related HVAC data and trouble codes	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback

B. Refrigeration System Component Diagnosis and Repair

Demonstrate knowledge of diagnosing A/C system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action	P-2	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of inspecting and replacing A/C compressor drive belts, pulleys, and tensioners; determine necessary action	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of inspecting, testing, and/or replacing A/C compressor clutch components and/or assembly; check compressor clutch air gap and adjust as needed	P-2	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback

Demonstrate knowledge of removing, inspecting, and reinstalling A/C compressor and mountings; determine required oil quantity	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of the need for an additional A/C system filter; perform necessary action	P-3	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of removing and inspecting A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action	P-2	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of inspecting A/C condenser for airflow restrictions; perform necessary action	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of removing, inspecting, and reinstalling receiver/drier or accumulator/drier; determine required oil quantity	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of removing, inspecting, and installing expansion valve or orifice (expansion) tube	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of inspecting evaporator housing water drain; perform necessary action	P-2	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of removing, inspecting, and reinstalling evaporator; determine required oil quantity	P-3	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of removing, inspecting, and reinstalling condenser; determine required oil quantity	P-3	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback

C. Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair		
Demonstrate knowledge of diagnosing temperature control problems in the heater/ventilation system; determine necessary action	P-2	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback

Demonstrate knowledge of performing cooling system pressure tests; check coolant condition, inspect and test radiator, cap (pressure/vacuum), coolant recovery tank, and hoses; perform necessary action	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of inspecting engine cooling and heater system hoses and belts; perform necessary action	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of inspecting, testing, and replacing thermostat and gasket/seal	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of determining coolant condition and coolant type for vehicle application; drain and recover coolant	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of flushing system; refilling system with recommended coolant; bleeding system	P-2	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of inspecting and testing cooling fan, fan clutch, fan shroud, and air dams; perform necessary action	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of inspecting and testing electric cooling fan, fan control system and circuits; determine necessary action	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge inspecting and testing heater control valve(s); perform necessary action	P-2	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of removing, inspecting, and reinstalling heater core	P-3	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback

D. Operating Systems and Related Controls Diagnosis and Repair

Demonstrate knowledge of diagnosing malfunctions in the electrical controls of heating, ventilation, and A/C (HVAC) systems; determine necessary action	P-2	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
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Demonstrate knowledge of inspecting and testing A/C-heater blower, motors, resistors, switches, relays, wiring, and protection devices; perform necessary action	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of testing and diagnosing A/C compressor clutch control systems; determine necessary action	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of diagnosing malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action	P-2	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of inspecting and testing A/C-heater control panel assembly; determine necessary action	P-3	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of inspecting and testing A/C-heater control cables, motors, and linkages; perform necessary action	P-3	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of inspecting A/C-heater ducts, doors, hoses, cabin filters and outlets; perform necessary action	P-2	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of identifying the source of A/C system odors	P-2	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of checking operation of automatic or semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action	P-2	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback

E. Refrigerant Recovery, Recycling, and Handling		
Demonstrate knowledge of performing correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of identifying and recovering A/C system refrigerant	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback

Demonstrate knowledge of recycling, labeling, and storing refrigerant	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback
Demonstrate knowledge of evacuating and charging A/C system; add refrigerant oil as required	P-1	Performance of Task during Lab/Shop Class with 100% Accuracy Lab Exercises Instructor Observation/Feedback

III. OUTLINE OF TOPICS

- A. AC System Diagnosis and Repair
 - 1. Properly fill out paperwork and locate service information
 - 2. Properly connect and use all necessary equipment for diagnosis
 - 3. Interpret results of diagnostic tests and compare to known good values
- B. Refrigeration System Component Diagnosis and Repair
 - 1. Locate, identify, and repair various malfunctions in an AC system
 - 2. Identify AC malfunctions caused by interrelated systems malfunctions
 - 3. Inspect AC components for damage/faults
 - 4. Replace/repair damaged or faulty AC components
- C. Heating, Ventilation, and Engine Cooling System Diagnosis and Repair
 - 1. Properly fill out paperwork and locate information on the ventilation and engine cooling systems
 - 2. Perform tests on the ventilation and engine cooling systems
 - 3. Repair/replace defective components in the ventilation and engine cooling systems
 - 4. Verify the repair using industry accepted practices
- D. Operating System and Related Controls Diagnosis and Repair
 - 1. Properly fill out paperwork and locate service information on HVAC controls
 - 2. Inspect and test HVAC electrical and vacuum controls
 - 3. Determine corrective actions for any conditions found during testing
 - 4. Repair/replace malfunctioning HVAC components
- E. Refrigerant Recovery, Recycling, and Handling
 - 1. Perform service procedures to meet EPA regulations and industry standards
 - 2. Properly identify the refrigerant used in the AC system
 - 3. Handle and store refrigerant per EPA regulations

IV. METHODS OF INSTRUCTION

- A. Live Work
- B. Lab Exercises

V. REQUIRED TEXTBOOKS

None

VI. REQUIRED MATERIALS

- A. Jefferson College Automotive Technology Shirt or Approved Sponsoring Shop Workshirt
- B. Safety Glasses
- C. Work Boots

VII. SUPPLEMENTAL REFERENCES

None

VIII. METHODS OF EVALUATION

- A. Student Participation 40%
- B. Shop Work 60%

IX. ADA AA STATEMENT

Any student requiring special accommodations should inform the instructor and the Coordinator of Disability Support Services (Technology Center 101; phone 636-481-3169).

X. ACADEMIC HONESTY STATEMENT

All students are responsible for complying with campus policies as stated in the Student Handbook (see College Website <http://www.jeffco.edu>).

XI. ATTENDANCE STATEMENT

Regular and punctual attendance is expected of all students. Any one of these four options may result in the student being removed from the class and an administrative withdrawal being processed: (1) Student fails to begin class; (2) Student ceases participation for at least two consecutive weeks; (3) Student misses 15 percent or more of the coursework; and/or (4) Student misses 15 percent or more of the course as defined by the instructor. Students earn their financial aid by regularly attending and actively participating in their coursework. If a student does not actively participate, he/she may have to return financial aid funds. Consult the College Catalog or a Student Financial Services representative for more details.

XII. OUTSIDE OF CLASS ACADEMICALLY RELATED ACTIVITIES

The U.S. Department of Education mandates that students be made aware of expectations regarding coursework to be completed outside the classroom. Students are expected to spend substantial time outside of class meetings engaging in academically related activities such as reading, studying, and completing assignments. Specifically, time spent on academically related activities outside of class combined with time spent in class meetings is expected to be a minimum of 37.5 hours over the duration of the term for each credit hour.