AUTOMOTIVE HEATING AND AIR CONDITIONING (NATEF COMPLIANT)
Course Syllabus

Course Number: ATOS-C1614  OHLAP Credit: No
OCAS Code: None
Course Length: 70 Hours
Career Cluster: Transportation, Distribution, and Logistics
Career Pathway: Automotive Service
Career Major(s): Automotive General Service Technician (NATEF Compliant)

Pre-requisite(s):

This course covers the automotive heating systems, air conditioning systems, parts identification and function, and system operations. Also in this course the student will cover the refrigerants used in air conditioning systems and how to identify them along with Federal Legislation. Temperature control components and systems will also be identified. The student will learn about the cooling system components, identifying coolant type, checking and adjusting coolant levels as well as checking and replacing coolant hoses. The student will also learn to flush and pressure test the coolant system.

The student will learn servicing procedures and how to operate testing and servicing equipment. The student will learn to evacuate and recharge air-conditioning systems using the proper refrigerant. The student will learn to evaluate and determine necessary action for compressor and clutch assemblies, and how to perform the replacement of these parts. The student will learn to perform component replacement, such as the receiver drier, expansion valve, orifice tube, hose assemblies and o-rings. The student will learn to troubleshoot heating and air-conditioning systems operation and how to evaluate climate control systems. This course covers both the electrical and vacuum controls. The student will also learn to diagnose air conditioning system failure concerns, such as the protection device interrupt system, temperature control problems, climate control systems, electrical controls for heating and ventilation, load cut-off systems and other climate control malfunctions. The student will also learn to evaluate and perform the necessary action of control panel assemblies, control cables, ducts, doors and outlets.

Textbooks:

Course Objectives: A. Complete Automotive Heating and Air-Conditioning Introduction
1. Discuss the history of the automotive heating and air conditioning.
2. Identify some of the present and future trends in heating and air conditioning.
3. Identify job opportunities available in the industry.
4. Locate and review MSDS sheets.
5. Review types and location of fire extinguishers.
7. Review current laws concerning "hazardous waste management" as it relates to Heating and Air Conditioning.
8. Discuss the purpose and components of the heating, ventilation, and air conditioning systems.
9. Describe the basic operation of the air conditioner refrigeration system.

10. Compare the two major types of refrigerant used in automotive air conditioning.

B. General: A/C System Diagnosis and Repair

1. Identify and interpret heating and air conditioning problems; determine necessary action. P-1

2. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

3. Performance test A/C system; identify problems. P-1

4. Identify abnormal operating noises in the A/C system; determine necessary action. P-2

5. Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings. P-1

6. Leak test A/C system; determine necessary action. P-1

7. Inspect condition of refrigerant oil removed from A/C system; determine necessary action. P-2

8. Determine recommended oil and oil capacity for system application. P-1

9. Using a scan tool, observe and record related HVAC data and trouble codes. P-3

C. Refrigeration System Component Diagnosis and Repair

1. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action. P-1

2. Inspect, test, service or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed. P-2

3. Remove, inspect, and reinstall A/C compressor and mountings; determine recommended oil quantity. P-2

4. Identify hybrid vehicle A/C system electrical circuits and service/safety precautions. P-2

5. Determine need for an additional A/C system filter; perform necessary action. P-3

6. Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action. P-2

7. Inspect A/C condenser for airflow restrictions; perform necessary action. P-1

8. Remove, inspect, and reinstall receiver/drier or accumulator/drier; determine recommended oil quantity. P-2

9. Remove, inspect, and install expansion valve or orifice (expansion) tube. P-1

10. Inspect evaporator housing water drain; perform necessary action. P-1
11. Determine procedure to remove and reinstall evaporator; determine required oil quantity. P-2

D. Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair

1. Inspect engine cooling and heater systems hoses; perform necessary action. P-1
2. Inspect and test heater control valve(s); perform necessary action. P-2
3. Determine procedure to remove inspect, and reinstall heater core. P-2

E. Operating Systems and Related Controls Diagnosis and Repair

1. Inspect and test A/C-heater blower motors, resistors, switches, relays, wiring, and protection devices; perform necessary action. P-1
2. Diagnose A/C compressor clutch control systems; determine necessary action. P-2
3. Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action. P-2
4. Inspect and test A/C-heater control panel assembly; determine necessary action. P-3
5. Inspect and test A/C-heater control cables, motors, and linkages; perform necessary action. P-3
6. Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action. P-1
7. Identify the source of A/C system odors. P-2
8. Check operation of automatic or semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action. P-2

F. Refrigerant Recovery, Recycling, and Handling

1. Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer’s standards. P-1
2. Identify and recover A/C system refrigerant. P-1
3. Recycle, label, and store refrigerant. P-1
4. Evacuate and charge A/C system; add refrigerant oil as required. P-1

1ASE objective
All unmarked objectives are TTC instructor developed.
### Teaching Methods:
The class will primarily be taught by the lecture and demonstration method and supported by various media materials to address various learning styles. There will be question and answer sessions over material covered in lecture and media presentations. Supervised lab time is provided for students to complete required projects.

### Grading Procedures:
1. Students are graded on theory and shop practice and performance.
2. Each course must be passed with seventy (70%) percent or better.
3. Grading scale: A=90-100%, B=80-89%, C=70-79%, D=60-69%, F=50-59%.

### Description of Classroom, Laboratories, and Equipment:
Tulsa Technology Center campuses are owned and operated by Tulsa Technology Center School District No. 18. All programs provide students the opportunity to work with professionally certified instructors in modern, well-equipped facilities.

### Available Certifications/College Credit
The student may be eligible to take state, national or industry exam after completion of the program. College credit may be issued from Oklahoma State University-Okmulgee or Tulsa Community College. See program counselor for additional information.

### College Credit Eligibility:
1. The student must maintain a grade point average of seventy (70%) percent or better.
2. The student must maintain an attendance record of ninety (90%) or better.