

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

Automotive Technology 171 – Climate Control System Diagnosis and Repair

1 hour lecture, 1 unit

Catalog Description

This lecture course demonstrates and describes climate control systems, theory, diagnosis and repair procedures utilizing state of the art equipment. This course applies basic heating and air conditioning test applications incorporating electronic controls units and computer networks. This course covers various vehicle computer functions such as: body electronics, climate control units, and electric vehicle and hybrid vehicle climate system operations. This course is preparation for ASE certification, and complemented by AUTO 171L Climate Control Diagnosis and Repair Lab, AUTO 171T Climate Control Diagnosis and Repair Assessment Test Out, and by Work Experience at the dealership.

Prerequisite

None

Course Content

- 1) Lecture:
 - a. Introduction and safety
 - b. Laboratory procedures
 - c. Equipment operation
 - d. Pressure cause and effect on gases
 - e. Automotive wiring systems relating to heating and air conditioning
 - f. Applied electro-magnetism by electric control units to operate clutches and solenoids
 - g. Storage capacitors
 - h. Electronic transistors
 - i. Computer memory programmable, random access memory, read only memory
 - j. Electronically controlled blend doors, variable displacement compressors
 - k. Heat exchangers
 - l. Electrical controls controlled by an electronic control unit (computer)
 - m. System diagnosis based on computer group functions
 - n. Computer inputs and outputs (sensors and actuators)
 - o. Complex wiring diagrams involving multiplexing
 - p. Thermistors and various sensor inputs

Course Objectives

Students will be able to:

- 1) Demonstrate standardized safety and hazardous waste handling practices.
- 2) Diagnose refrigeration, heating, air management, and control subsystem concerns.
- 3) Diagnose powertrain control concerns related to the compressor clutch and electric cooling fan circuit(s).
- 4) Use special service tools and diagnostic and service equipment related to the refrigeration, heating, and control subsystems.
- 5) Perform service procedures related to the refrigeration, heating, air management, and control subsystem.
- 6) Navigate a wiring diagram and describe the expected voltages under varying conditions of the climate control system.

- 7) Locate and perform a pinpoint test on a training vehicle and demonstrate the ability to accurately test climate control systems.
- 8) Interpret refrigerant pressure readings to determine A/C system efficiency.
- 9) Activate a climate system component on a training vehicle using the correct methods.
- 10) Demonstrate how to use Flex Probes, computer diagnostic software, and Digital Multi Meter to perform electronic climate control tests.
- 11) Demonstrate the ability to use a scan tool to access and manipulate parameter identification data (PIDs) to diagnose a climate control system.

Method of Evaluation

A grading system will be established by the instructor and implemented uniformly. Grades will be based on demonstrated proficiency in subject matter determined by multiple measurements for evaluation, one of which must be essay exams, and skills demonstration using distance education tools and equipment. Students will be required to submit performance projects demonstrating their knowledge, skills, and abilities to perform accurate diagnosis, repair, and workshop manual navigation for climate control systems.

- 1) Distance education tools will be used to assign quizzes, written exams, and hands-on performance exams that measure students' ability to safely identify necessary actions or systems tests, diagnose electronic system components, and perform necessary tasks related to vehicle electronics.
- 2) Students will be required to perform web based training modules and webinars listed on the training website.
- 3) Students will use project based skills-based summative assessments that measures students' ability to successfully complete the necessary ASE tasks related to diagnosis, replacement, repair, testing, and adjustment of climate control systems.
- 4) A required student portfolio digitally stores competencies.

Special Materials Required of Student

- 1) Approved safety glasses
- 2) Students must have access to high speed internet and a computer device with large screen
- 3) Students must have appropriate dress code

Minimum Instructional Facilities

- 1) Auto tech lab (20 bays)
- 2) Various training vehicles
- 3) Smart classroom
- 4) Distance education equipment
- 5) Technologies and service equipment

Method of Instruction

- 1) Lecture and demonstration are both synchronous and asynchronous. Students are required to attend all lectures and participate with the instructor and other students during live lectures. Students will have access to recorded lectures.
- 2) Individual assistance by file sharing, computer sharing, live demonstration of project based methods for diagnosing and repairing actual vehicles.
- 3) Discussion boards will be used to assign weekly reflections and posting of student assignments.
- 4) A classroom management system will be broadcast as group assignments.

Out-of-Class Assignments

- 1) **Reading:** training-module content; assigned readings on standardized safety procedures and hazardous waste handling requirements; other technical bulletins or industry articles explaining common performance issues and updated diagnostic procedures.
- 2) **Writing:** diagnostic summaries; interpretations of readings and identifying what the values indicate about system efficiency; brief written analysis of a wiring diagram; reflection describing the use of diagnostic tools.

- 3) **Other:** complete web-based training modules and webinars; maintain a portfolio of certificates and competencies; quizzes and tests.

Texts and References

- 1) Required (representative examples):
 - a. Student workbooks – will be provided electronically.
 - b. Required: VanGelder, Kirk. Fundamentals of Automotive Technology. Jones and Bartlett Learning, 2023.
 - c. Web Based Training Modules will be provided electronically.
 - d. Workshop Manuals will be provided electronically.
- 2) Supplemental: None

Student Learning Outcomes

Upon successful completion of this course, students will be able to:

- 1) Accurately repair various climate control system conditions.
- 2) Identify advanced climate system problems by navigating the workshop manual based on symptoms or codes.
- 3) Communicate effectively and professionally in a diverse setting that includes prospective colleagues, clients, and supervisors.
- 4) Comply with environmental health and safety regulations at the state and federal levels.