

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

AUTOMOTIVE TECHNOLOGY 165 – ADVANCED AIR CONDITIONING AND HEATING SYSTEMS

2 hours lecture, 3 hours laboratory, 3 units

Catalog Description

Advanced course in automotive environmental control systems emphasizing advanced diagnosis and repair. Designed to develop greater student performance under simulated industry conditions. Students will be required to complete associated tasks in the shop as specified by NATEF (National Automotive Training Educational Foundation). Preparation for ASE A-7 Certification.

Prerequisite

“C” grade or higher or “Pass” in AUTO 160 or equivalent

Entrance Skills

Without the following skills, competencies and/or knowledge, students entering this course will be highly unlikely to succeed:

- 1) Understand nomenclature and operational theory of automotive air conditioning systems.
- 2) Diagnose automotive air conditioning and heating system components (HVAC).
- 3) Diagnose HVAC systems using standard pressure charts and standard gauge set.
- 4) Remove and replace HVAC system components.
- 5) Recover refrigerant, evacuate and recharge HVAC system.
- 6) Find refrigerant leaks using dye and electronic detector methods.
- 7) Diagnose and repair HVAC controls and ducting.

Course Content

- 1) Lecture:
 - a. Introduction and safety
 - b. Principles of refrigeration
 - c. Refrigerants
 - d. Electrical controls
 - e. Electronic/automatic temperature control systems
 - f. Moisture removal
 - g. Service valves
 - h. Manifold gauge set
 - i. Leak detectors
 - j. Receiver driers
 - k. Thermatic expansion valves and related refrigerant control techniques
 - l. Temperature pressure relationships
 - m. System diagnosis
- 2) Lab:
 - a. Introduction and safety
 - b. Laboratory procedures
 - c. System diagnosis
 - d. Diagnose and repair electronic/automatic temperature control system
 - e. Leak testing
 - f. Pressure checks
 - g. Evacuating system

- h. Compressor repair
- i. Clutch repair
- j. Checking and adding oil
- k. Testing various regulator valves
- l. Component replacement
- m. Vacuum controls

Course Objectives

Students will be able to:

- 1) Demonstrate standardized safety and hazardous waste handling practices.
- 2) Independently apply air conditioning and heating operating theory to diagnose heating and air conditioning systems for proper operation.
- 3) Independently diagnosis air conditioning and heating systems in need of repair by applying theory of operation principles and prescribed industry standards.
- 4) Using proper tools and procedures, independently diagnose air conditioning systems by comparing high and low side gauge readings to ambient temperatures.
- 5) Independently perform actual repairs on live automobiles to prescribed industry standards.
- 6) Utilize manufacturers' repair information and technical service bulletins for accurate diagnose and repair.

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, skills demonstration or, where appropriate, the symbol system.

- 1) Quizzes, written exams, and hands-on performance exam that measure students' ability to safely identify necessary action or repair, diagnose air conditioning and heating system components, and perform necessary tasks related to air conditioning and heating.
- 2) Practical exercises that measure students' progress toward mastering tasks related to diagnosis, replacement, repair, testing, and adjustment of air conditioning and heating systems and components.
- 3) Skills-based summative assessment that measures students' ability to successfully complete the necessary NATEF tasks related to diagnosis, replacement, repair, testing, and adjustment of air conditioning and heating systems and components.

Special Materials Required of Student

- 1) Basic hand tool set
- 2) Approved safety goggles (must have shielded vents)
- 3) Specialized air conditioning tools

Minimum Instructional Facilities

- 1) Auto tech lab (6 bays)
- 2) Complete air conditioning and heating service equipment center
- 3) Smart classroom

Method of Instruction

- 1) Lecture and demonstration
- 2) Individual assistance

Out-of-Class Assignments

- 1) Reading assignments
- 2) Written homework

Texts and References

- 1) Required (representative example): Santini, Automotive Automatic Transmissions and Transaxles, First Edition. CDX Master Automotive Technician Series 2018, ISBN: 9781284102093
- 2) Supplemental: None

Student Learning Outcomes

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

- 1) Diagnose and repair various climate control systems, including electric variable displacement, using the workshop manual and electronic equipment test.
- 2) Describe climate control systems theory and operation, and document repair processes.
- 3) Demonstrate standardized safety and hazardous waste handling practices according to industry standards.