

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

Automotive Technology 264 – Hybrid and Electric Vehicle Operation and Diagnosis

1 hour lecture, 1 unit

Catalog Description

This lecture is a manufactures course required for certification of hybrid and electric vehicle (EV) systems for passenger cars and light trucks. The history of battery technologies will apply charging and repair techniques from first generation to present day EVs. EV technologies have evolved rapidly, requiring different methods of service for each new generation and system version. High voltage systems are dangerous. Proper safety procedures for hybrid and EV systems are required and emphasized. This course uses actual hybrids and EVs to perform electrical and electronic diagnosis of various systems. Students must have prerequisite knowledge and skill certifications of automotive electronics prior to enrolling in this course. This course is complemented by AUTO 264L Hybrid and Electric Vehicle Operation and Diagnosis Laboratory and AUTO 264T Hybrid and Electric Vehicle Operation and Diagnosis Assessment Test Out.

Prerequisite

None

Recommended Preparation

“C” grade or higher or “Pass” in AUTO 162T Electronics Diagnosis and Repair Assessment Test Out or the equivalent.

Entrance Skills

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

- 1) Demonstrate computer input and output tests and activation using a scan tool
- 2) Obtain and describe normal and abnormal waveforms using a lab-scope
- 3) Test thermistor, potentiometer, variable reluctance, pressure, Hall-effect and related sensors
- 4) Graph and interpret system data using PIDS on a scan tool
- 5) Diagnose and repair computer communication networking faults
- 6) Describe types and functions of computer memory including RAM, ROM, and PROM
- 7) Demonstrate proper diagnosis and repair of electronic system concerns

Course Content

- 1) Lecture and lab demonstrations:
 - a. Service disconnect, 120 Volt Convenience Cord and engine cranking/engine running Diagnostic Modes
 - b. Hybrid vehicle component location and function
 - c. Vehicle operating conditions scan tool recording
 - d. eCVT gear set operation
 - e. Service publication navigation
 - f. Difference between a running and cranking gasoline engine
 - g. No start diagnosis
 - h. Fuel system and evaporative emissions operation
 - i. Hybrid start-stall, high voltage battery charger and intermittent stall scan tool recording
 - j. Battery Electric Vehicle (BEV) scan tool recording

- k. Yellow Wrench Light On diagnosis
- l. High voltage battery charging
- m. eCVT scan tool recording
- n. Regenerative braking scan tool recording

Course Objectives

Students will be able to:

- 1) Demonstrate standardized safety handling practices of high voltage systems.
- 2) Locate and describe hybrid vehicle components (on-vehicle).
- 3) Correctly navigate the service publications and wiring diagrams for plug-in hybrid and electric vehicles.
- 4) View PIDs and correctly identify engine operating conditions.
- 5) Distinguish between a cranking and running hybrid gasoline engine.
- 6) Correctly place the vehicle in the engine cranking diagnostic and engine running diagnostic modes.
- 7) Identify plug-in hybrid EVAP system operation.
- 8) Diagnose various plug-in hybrid concerns and DTCs.
- 9) Accurately repair various conditions of hybrid and EV systems.
- 10) Repair a hybrid or EV system problem by navigating the workshop manual based on symptoms or codes.
- 11) Communicate effectively and professionally in a diverse setting that includes prospective colleagues, clients, and supervisors.
- 12) Comply with environmental health and safety regulations at the state and federal levels.

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 using distance education technologies, performance projects where a student is required to submit assigned artifact examples of specific competencies or, where appropriate:

- 1) Quizzes, written exams, and hands-on performance exam that measure students' ability to safely identify necessary action or repair using distance education methodologies.
- 2) Observe and document student progress while working on necessary tasks relating to diagnosis, replacement, repair, testing, and adjustment of hybrid and electric vehicle systems and components.
- 3) Manufacturer required skills-based summative assessment that measures students' ability to successfully complete the necessary NATEF ASE tasks related to diagnosis, replacement, repair, and testing of EVs, by completing required specific tasks in the student's competency record book.
- 4) Students must complete all of the required web-based training modules.
- 5) Student portfolios will be used to evaluate recorded assignments as artifacts.

Special Materials Required of Student

- 1) Approved safety glasses
- 2) High speed internet connection
- 3) Students will have access to testing tools and equipment while on campus
- 4) Safety dress code is required

Minimum Instructional Facilities

- 1) Auto tech lab (20 bays)
- 2) Various training vehicles
- 3) Distance education technologies
- 4) Various training vehicles

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 vehicles.
- 3) Discussion boards will be used to assign weekly reflections and posting of student assignments.
- 4) Manufacturers classroom management system will be broadcast as group assignments.
- 5) Surveys of student and teacher proficiency and instruction.

Out-of-Class Assignments

- 1) **Reading:** assigned course materials, manuals, content on websites, and more.
- 2) **Writing:** assignments where students describe the required tasks related to diagnosis, replacement, repair, testing, and adjustment of hybrid and electric vehicle systems and components, and more.
- 3) **Other:** web-based training modules (pass online pretests prior to laboratory "Test Out"), portfolio performance projects related to hybrid and electric vehicle systems and components, and more.

Texts and References

- 1) Required (representative examples):
 - a. Student workbooks – will be provided electronically.
 - b. Light Duty Hybrid and Electric Vehicles First Edition, 2023. ISBN:9781284198010
 - 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 conditions of hybrid and EV systems.
- 2) Repair a hybrid or EV system problem 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.