

AUTO-2650: HYBRID VEHICLE SAFETY AND SERVICE

Cuyahoga Community College

Viewing: AUTO-2650 : Hybrid Vehicle Safety and Service

Board of Trustees:

November 2024

Academic Term:

Fall 2025

Subject Code

AUTO - Automotive Technology

Course Number:

2650

Title:

Hybrid Vehicle Safety and Service

Catalog Description:

Working safely with hybrid vehicles is reviewed and practiced. Advantages and disadvantages of various battery types, hybrid designs and electric motors are examined. Hands-on course utilizes scan tools and diagnostic process to analyze and troubleshoot hybrid vehicles.

Credit Hour(s):

3

Lecture Hour(s):

2

Lab Hour(s):

2

Requisites

Prerequisite and Corequisite

AUTO-1502 Automotive Electrical Fundamentals, or departmental approval.

Outcomes

Course Outcome(s):

Apply knowledge of hybrid vehicles to evaluate their use as a primary or alternative transportation method in relation to conventional vehicles.

Objective(s):

1. List the advantages and disadvantages of an automotive hybrid in comparison with a conventional gasoline vehicle.
2. Explain how efficiency of a hybrid electric vehicle can be improved by the driver.
3. Provide a cost comparison between hybrid and conventional gas vehicles over 5, 10 and 15 years.

Course Outcome(s):

Follow proper safety protocols when working with hybrid vehicles.

Objective(s):

1. Review how the hybrid vehicle is identified, and how the vehicle is marked so other workers are aware.
2. List the high voltage system disable steps completed before working on a hybrid vehicle.

Course Outcome(s):

Using a digital volt-ohmmeter, show proof that a hybrid battery high voltage system has powered down. Knowing the principles of technology in hybrid vehicles, utilize service information and special service tools to safely and properly troubleshoot and repair those vehicles.

Objective(s):

1. Explain what safety equipment is necessary when servicing hybrid electric vehicle.
2. Provide a cost analysis of the safety equipment and tools that are needed to work on hybrid electric vehicles.
3. Using the appropriate scan tools, review data stream information for proper functioning.
4. Analyze a computer trouble code related to the hybrid high voltage system and repair the condition.

Course Outcome(s):

Explain the advantages and disadvantages of the hybrid vehicles currently available, by technology and special features.

Objective(s):

1. Synthesize a review of the ease of serviceability between two automotive hybrid manufacturers.
2. Synthesize a review of the powertrain delivery between two automotive hybrid vehicle manufacturers.
3. Synthesize a review of the electric motor drive cycle functioning between two automotive hybrid vehicle manufacturers.

Methods of Evaluation:

1. Written Assignments
2. Quizzes
3. Exams
4. Presentations
5. Classroom Participation
6. Observation of Classroom Behavior
7. Field Trip Attendance
8. Field Trip Reports

Course Content Outline:

1. Introduction to Hybrid Vehicles
 - a. History of hybrid vehicles
 - b. Classifications and terminology for hybrid vehicles
2. Hybrid Batteries and Battery Service
 - a. Nickel-metal hydride
 - b. Lithium ion and lithium polymer
 - c. Servicing hybrid vehicle battery packs
3. Electric Motors, Generators and Controls
 - a. AC motors, DC motors and their advantages
 - b. Electric power needs during a drive cycle
 - c. Controllers, inverters and converters
4. Hybrid Safety and Service Procedures
 - a. High Voltage Safety
 - b. High Voltage Safety Equipment
 - c. Depowering the High Voltage System
 - d. Moving and Towing a Hybrid
5. Hybrid Vehicle Auxiliary Systems
 - a. Regenerative Braking Systems
 - b. Hybrid Vehicle Transmissions and Transaxles
 - c. Hybrid Vehicle Heating and Air Conditioning
6. Hybrid vehicle manufacturer specifics
 - a. Honda Hybrid Vehicles
 - b. Toyota/Lexus Hybrid Vehicles
 - c. Ford Hybrid Vehicles
 - d. General Motors Hybrid Vehicles
7. Hybrid Vehicle Diagnostic Systems

- a. Scan Tools and Trouble Codes
- b. Isolated Cables and Insulation Testing

Resources

Halderman, James and Ward, Curt. (2023) *Electric and Hybrid Electric Vehicles*, Hoboken, NJ: Pearson Education, Inc.

Bennett, Sean. (2024) *Electric Vehicles: A Systems Approach*, Tinley Park, Ill: The Goodheart-Willcox Company, Inc.

Resources Other

1. Website: Hybrid and Electric Cars. Home page, <http://www.greencars.com> (<http://www.hybridcars.com>).
2. Website: U.S. Environmental Protection Agency. Fuel economy ratings for late model hybrid/electric vehicles, <https://www.epa.gov/greenvehicles> (<https://www.epa.gov/greenvehicles/>).
3. Website: Dept. of Energy. First responder information for hybrid/electric vehicles, <https://afdc.energy.gov/vehicles/electric-responders> (<https://afdc.energy.gov/vehicles/electric-responders/>).

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