AUTO G170: HYBRID VEHICLES

Item	Value
Top Code	094840 - Alternative Fuels and Advanced Transportation Technology
Units	3 Total Units
Hours	72 Total Hours (Lecture Hours 45; Lab Hours 27)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S)

Course Description

Formerly: Hybrid Vehicles. This course is a hands-on approach to the world of hybrid, hydrogen fuel cell, and electric powered vehicles and prepares students for successful completion of the ASE L-3 exam. Explore technologies including configuration, operation, and maintenance of hybrid-electric powertrain systems while observing industry safety process and procedures. PREREQUISITE: AUTO G120. Transfer Credit: CSU.

Course Level Student Learning Outcome(s)

1. Course Outcomes
2. Diagnose automotive hybrid systems faults for normal system operation.
3. Use diagnostic tools and equipment used for hybrid automotive repair.
4. Identify high voltage systems and components.

Course Objectives

- 1. Illustrate advances that Electric Vehicles, which include hybrids, fuel cells, and other emerging electric vehicle technologies, bring to vehicular travel and emission reduction.
- 2. Identify key features of EV technology that meet existing transportation needs as well as environmental requirements today.
- 3. Examine the differences between "real" transportation performance requirement and what the general public "perceives" as their transportation performance requirements.
- 4. List the components of an EV by manufacturer.
- 5. Demonstrate safe methods of EV conversion, repair and operation.
- 6. Disassemble a completed EV and identify its components and their function.
- 7. Compare a disassembled EV to the vehicle to be converted and formulate plans for the conversion of an electric vehicle.
- 8. Re-assemble the disassembled EV to its original condition.
- 9. Properly use alternate fuel vehicle nomenclature.

Lecture Content

A. Safety issues with EVs1. High voltage2. Battery concerns3. Weight distribution4. Handling concerns5. Braking concerns6. Periodic maintenance B. EV safety procedures1. Handling high voltage components2. Proper dress for safety3. Eye protection4. Hand protection5. Insulation6. Tool types and selection C. Comparative analysis of EV conversions1. Internal combustion powered vehicles2. Original Equipment Manufacturer (OEM) - built EVs3. Fuel Cells4. Hybrid EVs D. Advantages and limitations of Electric Vehicles1. Operating range2. Fuel costs and savings3. Long term costs4. Component replacement5. Driveability6. Performance E. Pre-construction evaluation of proposed EV and its components1. Selecting the correct platform2. Selecting the drive system3. Choosing AC or DC4. Analyzing cost versus performance5. Availability of materials F. Disassembly of an electric vehicle1. Safety issues2. Documentation of disassembly procedures3. Selection of proper tools4. Do No Harm G. Identification of EV systems and components, their locations and functions1. Motors2. Controllers3. Batteries and capacitors4. Wiring5. AC to DC converters6. Auxilliary sytems7. Instrumentation8. Chargers H. Identification of sources and types of components utilized in EVs 1. OEM2. After-market3. Salvaged components4. Used parts market5. Aircraft surplus I. Testing of systems and components J. Design an EV1. Hybrid electric2. Fuel cell3. Conventional battery powered K. Governmental regulations, standards and incentives related to EV owners1. Tax breaks2. Diamond lane3. Registration4. Smog Check L. Introductio n to systems upgrades for EV components M. Acquisition and adaptation of EV conversion components and their installation N. Testing and evaluation of EVs O. Basic shop skills overview and development P. Shop equipment and hand tool safety

Lab Content

A. EV safety procedures 1. Demonstrate the proper way to deactivate the vehicles high amperage system.2. Perform vehicle deactivation and demonstrate proper start-up procedure after service.3. Explain the importance of proper grounding of technician to prevent electrical shock while servicing system.4. Explain importance of orange colored harness as a high voltage power supply. B. Disassembly of EVs 1. Demonstrate proper deactivation of vehicles power supply. 2. Explain importance of technician grounding to prevent electrical shock.3. Explain importance of proper tool use while performing electrcial diagnositcs. Some tools may supply current and damage integrated circuitry. C. Identificatin of EV components 1. Perform component identification of components.2. Describe function of components.3. Demonstrate proper diagnosis of EV components.4. Identify computer newtworking components. D. Testing of Components 1. Demonstrate different test procedures for EVs compared to Hybrid vehicles.2. Demonstrate different test procedures for Fuel Cell vehicles.3. Demonstrate communication between vehicles body and powertrain control modules.

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)
- Lab (04)
- DE Live Online Lab (04S)
- DE Online Lab (04X)

Reading Assignments

TextWebsites - ase.com, natef.org, era.org

Writing Assignments

1. Demonstrate ability to retrieve service information wiring diagrams and TSBs of a vehicle.2. Demonstrate understanding of Ohms Law by performing Voltage Drops in a circuit.3. Demonstrate understanding in diagnositc and service principles of the starting, charging and battery circuits.

Out-of-class Assignments

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Demonstration of Critical Thinking

1. Analyze wiring diagrams to determine circuit faults.2. Perform diagnosis and service to battery.3. Perfom diagnosis and service to starting, charging and lighting circuits.4. Perform diagnosis and service to gauges and accessories circuits.5. Perform diagnosis of vehicles body and powertrain control modules.

Required Writing, Problem Solving, Skills Demonstration

1. Demonstrate ability to retrieve service information wiring diagrams and TSBs of a vehicle.2. Demonstrate understanding of Ohms Law by performing Voltage Drops in a circuit.3. Demonstrate understanding in diagnositc and service principles of the starting, charging and battery circuits.

Eligible Disciplines

Automotive technology: Any bachelors degree and two years of professional experience, or any associate degree and six years of professional experience.

Textbooks Resources

1. Required John Lowry and James Larminie. Electric Vehicle Technology Explained, 1st ed. Wiley, 2003 Rationale: .