

AUTO 043B: HYBRID, FUEL-CELL & ELECTRIC VEHICLE DIAGNOSIS & REPAIR

Originator

dredman

Co-Contributor(s)**Name(s)**

Anderson, Dorothy

Justification / Rationale

The Automotive Faculty are reviewing and/or updating this course to assure compliance with local, State, and Federal regulations; support consistency within the curriculum; practice relevance regarding automotive industry and community; and to make improvements that will strengthen the learning environment this course creates thus benefiting the learners.

Effective Term

Fall 2022

Credit Status

Credit - Degree Applicable

Subject

AUTO - Automotive Technology

Course Number

043B

Full Course Title

Hybrid, Fuel-Cell & Electric Vehicle Diagnosis & Repair

Short Title

HYBRID DIAG & REPAIR

Discipline**Disciplines List**

Automotive Technology

Modality

Face-to-Face

Catalog Description

This course provides the learners with the skills to diagnose and repair basic to intermediate-level malfunctions with hybrid, fuel-cell, and electric vehicles.

Schedule Description

Hybrid, Fuel-Cell, and Electric Vehicle Diagnosis and Repair. Prerequisite: AUTO-011B or concurrent enrollment, and AUTO 043A.

Lecture Units

2

Lecture Semester Hours

36

Lab Units

1

Lab Semester Hours

54

In-class Hours

90

Out-of-class Hours

72

Total Course Units

3

Total Semester Hours

162

Prerequisite Course(s)AUTO 043A and
AUTO 011B or concurrent enrollment**Required Text and Other Instructional Materials****Resource Type**

Web/Other

Open Educational Resource

No

Year

2021

Description

Instructor hand-outs and manufacturer materials.

Resource Type

Book

Formatting Style

APA

Author

M. Ellison

Title

Automobiles Have Computers?

Edition

1

City

Dubuque, IA

Publisher

Kendall Hunt

Year

2022

College Level

Yes

Flesch-Kincaid Level

13

ISBN #

978-1-7924-9479-6

Class Size Maximum

21

Entrance Skills

Repair order familiarization.

Requisite Course Objectives

AUTO 011B-Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.

AUTO 043A-Demonstrate familiarity with reference materials such as schematics, flow charts, logic trees, and workshop manuals to aid in battery system troubleshooting.

Entrance Skills

Describe common electrical concerns.

Requisite Course Objectives

AUTO 011B-Identify and interpret electrical/electronic system concern; determine necessary action.

Entrance Skills

Demonstrate proficiency in performing electrical circuit tests.

Requisite Course Objectives

AUTO 011B-Check electrical circuits using fused jumper wires; determine necessary action.

Entrance Skills

List high voltage safety procedures.

Requisite Course Objectives

AUTO 043A-Demonstrate the precautions, personal and shop safety procedures needed to safely work with high-voltage systems.

Entrance Skills

High voltage vehicle component familiarization.

Requisite Course ObjectivesAUTO 043A-Demonstrate acquired knowledge related to the components used on modern hybrid/electric/fuel-cell vehicles.

Course Content

1. Safety
 - a. Personal protection equipment (PPE)
 - b. Tools and meters
 - c. Facility/work area safety
 - d. High Voltage (HV) batteries, inverters, capacitors
 - e. Fuel-cells
 - f. First-aid, rescuing a coworker
2. History
 - a. The first hybrid, fuel-cell, elect vehicles
 - b. Modern era history and progression
 - c. Why hybrid, fuel-cell, electric vehicles (federal/state regulations; fossil fuels; environmental concerns)
3. Customer
 - a. Demographic/profile of typical buyer
 - b. Customer expectations
 - c. The customer and the owner's manual
 - d. How to interact with hybrid, fuel-cell, electric vehicle customers

- e. Refueling
 - f. How to drive the car for maximum range
4. Common Components
- a. 12v systems
 - i. 12v battery
 - ii. Lighting
 - iii. Customer convenience
 - b. HV systems
 - i. High Voltage (HV) battery
 - ii. Inverter
 - iii. Fuel-cell
 - iv. High Voltage (HV) safety systems
 - c. Internal combustion engine in hybrid
 - i. Atkinson cycle
 - d. Regular maintenance
 - i. Filters
 - ii. Engine, transmission oils
 - iii. Regular visual inspections
5. Toyota Prius (or equivalent hybrid vehicle)
- a. Warnings/ cautions/ dangers (service information)
 - b. System type
 - c. Common component function and location
 - d. Unique component function and location
 - e. Familiarity and navigation of service information
 - f. Unique maintenance procedures
 - g. Scan tool familiarity
 - h. Diagnostics and troubleshooting
6. Toyota Mirai (or equivalent fuel-cell vehicle)
- a. Warnings/ cautions/ dangers (service information)
 - b. System type
 - c. Common component function and location
 - d. Unique component function and location
 - e. Familiarity and navigation of service information
 - f. Unique maintenance procedures
 - g. Scan tool familiarity
 - h. Diagnostics and troubleshooting
7. Fiat E (or equivalent electric vehicle)
- a. Warnings/ cautions/ dangers (service information)
 - b. System type
 - c. Common component function and location
 - d. Unique component function and location
 - e. Familiarity and navigation of service information
 - f. Unique maintenance procedures
 - g. Scan tool familiarity
 - h. Diagnostics and troubleshooting
8. Honda Civic Hybrid (or equivalent hybrid vehicle)
- a. Warnings/ cautions/ dangers (service information)
 - b. System type
 - c. Common component function and location
 - d. Unique component function and location
 - e. Familiarity and navigation of service information
 - f. Unique maintenance procedures
 - g. Scan tool familiarity
 - h. Diagnostics and troubleshooting
9. Chevrolet Volt (or equivalent plug-in hybrid vehicle)
- a. Warnings/ cautions/ dangers (service information)
 - b. System type

- c. Common component function and location
 - d. Unique component function and location
 - e. Familiarity and navigation of service information
 - f. Unique maintenance procedures
 - g. Scan tool familiarity
 - h. Diagnostics and troubleshooting
10. Service Information
- a. Wiring diagrams
 - b. Special tools
 - c. Diagnostic Trouble Codes
11. Scan Tool
- a. Interpreting service information descriptions with generic scan tools
 - i. Symptom based
 - ii. Diagnostic Trouble Code (DTC) based
 - b. Updating the scan tool
 - c. Navigation
 - i. Inputs vs. outputs
 - d. Generic mode vs. Original Equipment Manufacturer (OEM) mode
 - e. Other functions
 - i. Oscilloscope
 - ii. Pressure measurement
 - iii. DMM functions
12. Diagnosis & Troubleshooting
- a. 5-step procedure
 - b. Original Equipment Manufacturer (OEM) service information
 - c. Aftermarket information
 - i. Mitchell 1
 - ii. Identifix
 - d. Training opportunities
 - i. Original Equipment Manufacturer (OEM)
 - ii. NAPA Part Suppliers
 - iii. Complementary coursework
 - e. Internet information
 - f. Diagnostic scenarios
13. Repair
- a. Safety
 - b. Unique issue with hybrid, fuel-cell and electric vehicles
 - c. When to send it to the dealer
 - d. Maintenance indicator lamps
 - e. Service lamps and icons unique to hybrid, full-cell and electric vehicles
14. Flash Reprogramming
- a. Safety
 - b. Proper set-up
 - c. What to do if the reprogramming fails
 - d. How to access the revised software

Lab Content

1. Safety.
2. Vehicle walk-a-round.
3. Ride and drive.
4. Standard test procedures.
5. Regular service activities.
6. Scan tool and service information activities.
7. Repair order completion.
8. Basic to intermediate diagnostic scenarios.
9. Flash reprogramming.

10. Automotive manufacturer web-based training.

Course Objectives

Objectives	
Objective 1	Describe safety procedures related to hybrid, fuel-cell and electric vehicle safety.
Objective 2	List the similarities and differences, from a customer's perspective, between hybrid, fuel-cell and electric vehicles and internal combustion engine (ICE) vehicles.
Objective 3	Compare and contrast the similarities and differences from the business perspective of servicing hybrid, fuel-cell and electric vehicles.
Objective 4	Describe the system operation, component location and diagnostic procedures for the top 5 OEM hybrid, fuel-cell and electric vehicles.
Objective 5	Diagnose, troubleshoot and repair basic to intermediate malfunctions of hybrid, fuel-cell and electric vehicles.
Objective 6	Flash reprogram a computer on a hybrid, fuel-cell or electric vehicle.

Student Learning Outcomes

Upon satisfactory completion of this course, students will be able to:	
Outcome 1	Describe safety procedures and concerns when diagnosing and repairing hybrid, fuel-cell and electric vehicles.
Outcome 2	Locate and follow manufacturer service information related to diagnosis and repair of hybrid, fuel-cell and electric vehicles.
Outcome 3	Model the proper diagnosis and repair a basic to intermediate-level customer concern using an industry standard scan tool.

Methods of Instruction

Method	Please provide a description or examples of how each instructional method will be used in this course.
Discussion	Provide feedback during discussions and active involvement in assignments.
Collaborative/Team	Respectful, active interaction in group activities.
Technology-based instruction	Use of state-of-the-art scan tools, service information, equipment and virtual reality.
Participation	Provide feedback during discussions and active involvement in assignments.
Lecture	Lectures will stimulate discussion and learning on theoretical and knowledge-based material.
Laboratory	Perform assigned laboratory tasks involving vehicles, equipment, and service information.

Methods of Evaluation

Method	Please provide a description or examples of how each evaluation method will be used in this course.	Type of Assignment
Written homework	As assigned after each session.	In and Out of Class
Student participation/contribution	Provide feedback during discussions and active involvement in assignments.	In Class Only
Mid-term and final evaluations	Cumulative midterm and final with a hands-on portion.	In and Out of Class
Group activity participation/observation	Respectful, active interaction in group activities.	In and Out of Class
Laboratory projects	The lab activities will require hands-on, live or simulated vehicle in a live or simulated setting.	In Class Only
Tests/Quizzes/Examinations	Periodic quizzes.	In and Out of Class

Assignments

Other In-class Assignments

1. Participate in discussions

2. Start assigned group presentations
3. Quizzes
4. Exams
5. Take notes from lecture

Other Out-of-class Assignments

1. Complete assigned reading from text and other material
2. Homework from the text
3. Complete assigned group presentations
4. Individual presentation
5. Take-home test
6. SP2 safety tests
7. Automotive manufacturer web-based training

Grade Methods

Letter Grade Only

MIS Course Data**CIP Code**

47.0614 - Alternative Fuel Vehicle Technology/Technician.

TOP Code

094840 - Alternative Fuels and Advanced Transportation Technology

SAM Code

B - Advanced Occupational

Basic Skills Status

Not Basic Skills

Prior College Level

Not applicable

Cooperative Work Experience

Not a Coop Course

Course Classification Status

Credit Course

Approved Special Class

Not special class

Noncredit Category

Not Applicable, Credit Course

Funding Agency Category

Not Applicable

Program Status

Program Applicable

Transfer Status

Transferable to CSU only

General Education Status

Y = Not applicable

Support Course Status

N = Course is not a support course

Allow Audit

Yes

Repeatability

No

Materials Fee

No

Additional Fees?

No

Approvals**Curriculum Committee Approval Date**

3/17/2022

Academic Senate Approval Date

3/24/2022

Board of Trustees Approval Date

4/22/2022

Chancellor's Office Approval Date

5/05/2022

Course Control Number

CCC000587600

Programs referencing this courseAutomotive Air Conditioning Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=104>)Automotive Braking Systems Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=109>)Automotive Light and Medium Duty Diesel Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=111>)Automotive Steering, Suspension, Alignment Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=112>)Hybrid, Fuel Cell, Electric Vehicle Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=198>)Automotive Introductions Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=201>)Advanced Transportation Technologies AS Degree (<http://catalog.collegeofthedesert.eduundefined/?key=44>)Advanced Transportation Technologies AS Degree (<http://catalog.collegeofthedesert.eduundefined/?key=45>)Automotive Technology AS Degree (<http://catalog.collegeofthedesert.eduundefined/?key=57>)