AUTO 283: FUEL-CELL VEHICLE TECHNOLOGY

Citrus College Course Outline of Record

Heading	Value
Effective Term:	Fall 2021
Credits:	3
Total Contact Hours:	54
Lecture Hours :	54
Lab Hours:	0
Hours Arranged:	0
Outside of Class Hours:	108
Prerequisite:	AUTO 190 and AUTO 282.
Strongly Recommended:	ENGL 101; Integrated Math 1 or Algebra 1.
Transferable to CSU:	Yes
Transferable to UC:	No
Grading Method:	Standard Letter, Pass/No Pass

Catalog Course Description

Intended for the incumbent worker, re-entry person or person seeking a career advancement in the automotive service industry. This course covers the service and diagnosis of fuel cell electric vehicle powertrains, including motor/generator, batteries, inverters and PEM fuel cell technology. 54 lecture hours.

Course Objectives

- Identify the advantages and disadvantages of each type of fuel cell structure.
- Identify the conditions necessary to optimize fuel cell performance.
- Demonstrate knowledge of safety precautions when working with hydrogen and a fuel cell vehicle.
- Inspect fuel storage systems for safe handling of hydrogen.
- Demonstrate knowledge of power generation in a PEM fuel cell.
- Demonstrate knowledge of vehicle safety systems related to hydrogen.
- Using previous knowledge of electric vehicle powertrains, describe the integration of a PEM fuel cell into the vehicle.

Major Course Content

1. Fuel Cell Technology
    a. History
    b. Advantages of Fuel Cells
    c. Disadvantages of Fuel Cells
    d. Applications
2. Principles of Operation
    a. Galvanic Cells
    b. Fuel Cells
3. Types of Fuel Cells
    a. Molten Carbonate Fuel Cells
    b. Solid Oxide Fuel Cells
    c. Alkaline Fuel Cells
    d. Phosphoric Acid Fuel Cells
    e. Proton Exchange Membrane (PEM) Fuel Cells
4. PEM Fuel Cell Stack Construction
    a. Membrane Electrode Assembly (MEA)
    b. Flow Field Plates
    c. Humidifiers
5. PEM Fuel Cell Performance
    a. Efficiency
    b. Polarization Characteristics
    c. Power Characteristics
    d. Temperature and Pressure Effects
    e. Stoichiometry Effects
    f. Humidity Effects
6. Fuel Cell Safety
    a. Hydrogen
        i. Leaks
        ii. Fires
        iii. Low Temperature Hazards
    b. High pressures
    c. Electrical Shock
    d. Chemical
        i. De-ionizing Resin
        ii. Ethylene Glycol
        iii. Purple K Dry Chemical Fire Retardant
    e. Physical
7. Fuel Storage System
    a. Tank inspection
    b. Leak detection system
8. Fuel delivery System
    a. Humidification system
    b. Control system
        i. Valving
        ii. Deiceer
        iii. Fire suppression system
9. Hybrid Electric Hydrogen Fuel Cell Vehicle
    a. Electric Drive Motors
    b. Auxiliary Power Units
    c. Generators
    d. Energy Storage Systems
    e. Regenerative Braking
    f. Control Systems

Suggested Reading Other Than Required Textbook

Vehicle Manufacture's Technician Handbook and on-line repair manuals.

Examples of Required Writing Assignments

Summary of Society of Automobile Engineers (SAE) white papers.

Examples of Outside Assignments

Technical journal articles covering advances in vehicle electrification and hybrid technology.

Instruction Type(s)

Lecture