

# AUTO 283: FUEL-CELL VEHICLE TECHNOLOGY

## Citrus College Course Outline of Record

Heading	Value
Effective Term:	Fall 2025
Credits:	3
Total Contact Hours:	54
Lecture Hours :	54
Lab Hours:	0
Hours Arranged:	0
Outside of Class Hours:	108
Total Student Learning Hours:	162
Prerequisite:	AUTO 190 and AUTO 282.
Strongly Recommended:	ENGL C1000; 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