

**J. Sargeant Reynolds Community College  
Course Content Summary**

**Course Prefix and Number:** AUT 256

**Credits:** 4

**Course Title:** Fuel Cell Electric Vehicles

**Course Description:** Introduces advanced automotive technologies, including hydrogen fuel cell electric vehicle systems and advanced automotive electronics. Teaches theory, function, and operation of fuel cell electric vehicles and provides students an opportunity to perform diagnostic procedures and maintenance for fuel cell electric vehicle systems. Focuses on safety. Prerequisite: AUT 245 or program head approval. Lecture 3 hours. Laboratory 3 hours. Total 6 hours per week.

**General Course Purpose:** Developed with funding provided by a grant from the Department of Energy, this course will serve as a requirement for the Advanced Automotive Technologies Career Studies Certificate. The course addresses the rapidly emerging automotive technologies of fuel cell power generation systems found in electric drive vehicles, which automotive technicians are now being required to service.

**Course Prerequisites and Co-requisites:**

**Prerequisite:** AUT 245 or program head approval

**Course Objectives:**

Upon completing the course, the student will be able to

- a. Demonstrate knowledge of safety in all areas of fuel cell electric power generation for electric drive vehicle maintenance;
- b. Explain principles of operation for fuel cell electric power generation for electric drive vehicle systems;
- c. Describe various fuel cell electric power generation systems and components and their relationship to electric drive vehicle system operation;
- d. Explain principles of operation for fuel cell electric power generation in electric drive vehicle systems; and
- e. Compare and contrast different types of fuel cell electric power generation systems found in electric drive vehicles.

**Major Topics to be Included:**

- a. Introduction to fuel cell electric vehicles
  1. History
  2. Early fuel cell electric vehicles
  3. What is a fuel cell?
  4. What is a fuel cell electric vehicle?
  5. Types of fuel cell electric vehicles
  6. Obstacles for fuel cell electric vehicles
- b. Electric drive vehicles safety procedures
  1. High voltage safety equipment
  2. First responder procedures
  3. Electric shock potential
  4. Preventing current flow through high-voltage cables

- c. Electric motors, generators, and controls
  - 1. Fundamentals of magnetism, electromagnetism, and electromagnetic induction
  - 2. Electric motors
  - 3. Brushless motors
  - 4. Motor control
  - 5. Capacitors in hybrid controllers
  - 6. Converters and inverters
  - 7. Electric power steering
- d. Fuel cells
  - 1. Fundamentals of the fuel cell
  - 2. Types of fuel cells
- e. Fuel cell vehicle electronic control systems
  - 1. Toyota Highlander
  - 2. Honda Clarity
  - 3. Nissan
  - 4. Ford
  - 5. GM

**Effective Date of Course Content Summary:** May 1, 2012