

AUT 285  
Introduction to Alternative Fuels

Prerequisites: None  
Corequisites: None

Course Description

This course is an overview of alternative fuels and alternative fueled vehicles. Students will learn about the make up and use of alternative fuels, including compressed natural gas, propane, biodiesel, ethanol, electric, hydrogen, and synthetic and the vehicles that use them. Upon completion, students should be able to identify which vehicles use alternative fuels and understand how each alternative fuel delivery system works and make minor repairs. Course Hours Per Week: Class, 2. Lab, 2. Semester Hours Credit, 2.

**COURSE OBJECTIVES:**

Upon completion of this course the student will be able to:

- a. Observe special safety procedures related to different alternative fuels.
- b. Locate relevant service information.
- c. Research system operation using technical information to determine diagnostic procedure.
- d. Use appropriate diagnostic procedures based on available vehicle data and service information.
- e. Use appropriate test equipment to diagnose problems with electronic sensors, controllers, and circuits.
- f. Explain the environmental impact of pollution caused by motor vehicles.
- g. Describe the role of alternative fuels in energy independence.
- h. Describe clean air and energy legislation efforts.
- i. Define the term "Alternative Fuel"
- j. Discuss the sources, uses, advantages and disadvantages of compressed natural gas, propane, biodiesel, ethanol, hydrogen, and synthetic fuels.
- k. Discuss the advantages and disadvantages of battery electric, hybrid, and fuel cell powered vehicles.
- l. Identify and test components of alternative fuel delivery systems.
- m. Diagnose driveability problems, determine necessary action
- n. Understand the process of converting a vehicle to use alternative fuels.

**OUTLINE OF INSTRUCTION:**

- I. Why do we need Alternative Fuels?
  - A. Oil dependency
    1. Supply and demand
    2. Oil prices
      - a.) Supply and demand

- 3. Peaking oil fields
- B. Vehicle emissions and air quality
  - 1. Exhaust emissions
  - 2. Pollution
    - a.) Health effects
    - b.) Environmental damage
  - 3. Climate change/global warming
- II. Laws, Regulations, Programs, Incentives
  - A. Legislation
    - 1. Clean Air Act and amendments
    - 2. Energy Policy Act (EPACT)
  - B. Department of Energy policies
    - 1. Clean Cities Program
    - 2. Research
  - C. EPA legislation and programs
  - D. Department of Transportation role
  - E. State Incentives/laws
- III. Propane
  - A. What is Propane/LPG
  - B. History of propane as vehicle fuel
  - C. Principles of propane vehicles
    - 1. Fuel systems
      - a.) Carburetor
      - b.) Fuel Injection
    - 2. Storage tank
  - D. Performance of propane vehicles
    - a.) Lower emissions
  - E. Conversions
  - F. Infrastructure requirements
- IV. Compressed Natural Gas
  - A. Overview of Natural Gas vehicles
  - B. Compressed Natural Gas safety
  - C. NGV technology
    - 1. System integration
    - 2. Pressure storage tanks
      - a.) types
  - D. Performance of NGVs
    - 1. Advantages and disadvantages
  - E. Infrastructure requirements
  - F. Conversions
    - 1. EPA Memo 1A

## V. Ethanol, Methanol, and Synthetic Fuels

- A. Introduction of alcohol based fuels
- B. Feed stock resources
  - 1. Corn
  - 2. Sugar Cane
  - 3. Biomass
    - a.) Celulosic
- C. Principles of ethanol vehicles
  - 1. Compatibility
  - 2. Components
  - 3. Performance settings
- D. Emissions reductions

## VI. Biodiesel

- A. History of Biodiesel
- B. Feed stocks
  - 1. Vegetable oil
    - a.) Virgin soy bean oil
    - b.) Used restaurant fryer oil
  - 2. Animal fat
- C. Advantages and disadvantages
- D. Emissions reductions
- E. Maintenance of a biodiesel engine

## VII. Battery Electric Vehicles

- A. History of electric vehicles
- B. Traction battery principles
  - 1. High voltage strings
  - 2. Charging
  - 3. Maintenance
- C. Traction motors
- D. Controllers and inverters
- E. Range
- F. Infrastructure

## VIII. Hybrid Electric Vehicles

- A. What is a hybrid vehicle?
- B. Drive train configurations
  - 1. Series
  - 2. Parallel
- C. Electric motor control
- D. ICE controls
- E. Hybrid module principles

## IX. Hydrogen- Powered Vehicles

- A. Hydrogen safety

- B. Hydrogen production
- C. ICE fuel system
- D. Components and Performance

X. Fuel Cell Vehicles

- A. Fuel cell operation
  - 1. Structure
  - 2. Function
- B. Electric motor principles
- C. Control systems
  - 1. Inverter
  - 2. Controller
- D. Emissions

XI. Emerging Technologies

**REQUIRED TEXTBOOKS AND MATERIALS:**

To be determined by Instructor.

**STATEMENT FOR STUDENTS WITH DISABILITIES:**

Students who require academic accommodations due to any physical, psychological, or learning disability are encouraged to request assistance from a disability services counselor within the first two weeks of class. Likewise, students who potentially require emergency medical attention due to any chronic health condition are encouraged to disclose this information to a disability services counselor within the first two weeks of class. Counselors can be contacted by calling 536-7207, ext. 1413 or by visiting the Student Development Office in the Phail Wynn Jr. Student Services Center, room 1309.