

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

Course Prefix and Number: AUT 230 **Credits:** 3

Course Title: Introduction to Alternative Fuels and Hybrid Vehicles

Course Description:

Introduces current trends in alternative fueled vehicles, including current alternative fueled vehicles and the implication and safety precautions necessary for working on hybrid vehicle systems. Lecture 3 hours per week. 3 credits

General Course Purpose:

To examine alternative fueled vehicle and hybrid electric vehicle systems. Safety will be emphasized.

Course Prerequisites and Co-requisites:

None

Student Learning Outcomes:

Upon completing the course, the student will be able to

- Demonstrate knowledge of safety in all areas of alternative fueled and hybrid vehicles;
- Understand principles of operation of alternative fueled and hybrid vehicle systems;
- Identify and list various alternative fueled and hybrid vehicle components and their relationship to hybrid system operation; and
- Describe and identify different types of alternative fueled and hybrid vehicles.

Major Topics to Be Included:

- a. Introduction to Alternative Fueled and Hybrid Vehicles
 1. What are Alternative Fueled and Hybrid Vehicles
 2. History
 3. Early Alternative Fueled and Hybrid Vehicles
 4. Types of Alternative Fueled and Hybrid Vehicles
- b. Alternative Fueled and Hybrid Vehicle Safety Procedures
 1. Alternative Fueled Vehicle Safety
 2. High Voltage Safety Equipment
 3. First Responder Procedures
 4. Electric Shock Potential
 5. Preventing Current Flow through High-Voltage Cables
- c. Alternative Fueled Vehicles
 1. Ethanol
 2. E85
 3. Methanol
 4. Propane
 5. Compressed Natural Gas (CNG)
 6. Liquefied Natural Gas (LNG)
 7. P-Series Fuels
 8. Synthetic Fuels

- 9. Bio-Diesel
- 10. Hydrogen
- d. Batteries and Battery Service
 - 1. Introduction
 - 2. Battery Technology
 - 3. High-Voltage Battery in the Hybrid System
 - 4. Nickel-Metal Hydride Technology
 - 5. Auxiliary Battery in the Hybrid System
 - 6. Lead-Acid Technology
 - 7. Lithium-Ion Battery Technology
- e. 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
- f. Regenerative Braking Systems
 - 1. Principles of Regenerative Braking
 - 2. Regenerative Braking
 - 3. How the Regenerative Braking System Works
 - 4. Deceleration Rates
- g. Hybrid Vehicle Transmissions and Transaxles
 - 1. Manual versus Automatic
 - 2. Conventional Automatic Transmissions
 - 3. Continuously Variable Transmissions (CVT)
- h. Hybrid Vehicle Heating and Air Conditioning
 - 1. Hybrid ICE Cooling and Cabin Heating
 - 2. Hybrid Electrical System Cooling
 - 3. Hybrid Air-conditioning Systems

Effective Date/Updated: January 24, 2019