

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

Course Prefix and Number: AUT 243

Credits: 4

Course Title: Automotive Control Electronics

Course Description: Introduces advanced automotive technologies, and covers the electronic control systems found in hybrid electric vehicle systems, battery electric vehicle systems, and fuel cell electric vehicle systems. Teaches theory, function, and operation of each electronic control system and provides students an opportunity to perform diagnostic procedures and maintenance for these 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: This course is a requirement for the Advanced Automotive Technologies Career Studies Certificate, addresses the rapidly emerging automotive technologies of electronic control systems found in electric drive vehicles, which automotive technicians are now being required to service. The course was developed with funding provided by a grant from the Department of Energy.

Course Prerequisites and Co-requisites:

Prerequisite: AUT 245 or program head approval.

Student Learning Outcomes:

Upon completing the course, the student will be able to

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

Major Topics to Be Included:

- a. Introduction to Control Electronics
 1. History
 2. Early electronic controls
 3. What is a hybrid vehicle
 4. Types of hybrid vehicles
 5. What is a battery electric vehicle
 6. Types of battery electric vehicles
 7. What is a fuel cell electric vehicle
 8. Types of fuel cell electric vehicles
 9. Electric motors
- 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. Hybrid Electric Vehicle Electronic Control Systems
 - 1. Toyota Prius
 - 2. Honda Civic
 - 3. Nissan
 - 4. Ford
 - 5. GM
- e. Battery Electric Vehicle Electronic Control Systems
 - 1. Solectria
 - 2. Ford Focus
 - 3. Nissan Leaf
- f. Fuel Cell Electric Vehicle Electronic Control Systems

Effective Date of Course Content Summary: June 12, 2018