South Central College

AST 1130  Introduction to Hybrid Electric Vehicles

Course Outcome Summary

Course Information
Description: This course introduces the fundamentals of hybrid electric vehicles. The course includes hybrid vehicle classifications, high voltage safety, vehicle systems, components, operation, and basic diagnosis. (Prerequisite: Admission to the Automotive Service program).

Total Credits: 1
Total Hours: 16

Types of Instruction
Instruction Type: Lecture
Credits/Hours: 1/16

Pre/Corequisites
Admission to the Automotive Service program

Institutional Core Competencies
Critical and Creative Thinking - Students will be able to demonstrate purposeful thinking with the goal of using a creative process for developing and building upon ideas and/or the goal of using a critical process for the analyzing and evaluating of ideas.

Course Competencies

1. Exhibit professionalism and reference vehicle service information
   Learning Objectives
   - Demonstrate professional conduct
   - Accept responsibility for the successful and timely completion of assignments
   - Research vehicle service information including safety warnings, diagnosis and repair procedures, and technical service bulletins

2. Identify the different types of hybrid electric vehicle configurations
   Learning Objectives
   - Describe a mild and full hybrid vehicle
   - Explain a series hybrid vehicle configuration
   - Explain a series/parallel hybrid vehicle configuration
   - Describe a plug-in hybrid electric vehicle
Contrast a hybrid electric vehicle and a pure electric vehicle

3. **Explain hybrid electric vehicle safety concerns**

   **Learning Objectives**
   - Explain hybrid electric vehicle high voltage safety considerations
   - Identify personal protective equipment required to work on high voltage systems
   - Describe high voltage safety practices
   - Describe equipment used to diagnose hybrid electric vehicle high voltage systems
   - Explain automatic engine starting considerations
   - Follow all applicable safety procedures when working on a hybrid electric vehicle

4. **Identify the major components of a hybrid electric vehicle**

   **Learning Objectives**
   - Describe the construction and operation of the high voltage battery
   - Describe the purpose and operation of the power inverter
   - Explain the construction and operation of the motor/generator
   - Describe the purpose of the DC to DC converter
   - Explain the operation of the Atkinson internal combustion engine
   - Contrast the operation of a hybrid electric vehicle and a pure electric vehicle

5. **Explain hybrid electric vehicle systems**

   **Learning Objectives**
   - Describe the purpose and operation of the interconnected electronic control modules
   - Explain the purpose and operation of the high voltage vehicle safety system
   - Describe the cooling systems for the power electronics and the high voltage battery
   - Explain the benefit and operation of regenerative braking

6. **Describe hybrid electric vehicle diagnosis**

   **Learning Objectives**
   - Identify system and component fault codes
   - Explain high voltage isolation faults and testing
   - Describe high voltage battery state of health and state of charge
   - Describe motor/generator testing

7. **Identify the unique vehicle maintenance consideration of a hybrid vehicle**

   **Learning Objectives**
   - Describe the power electronics cooling system service requirements
   - Describe battery pack ventilation and cooling system service
   - Identify hydraulic brake system inspection and service concerns

**SCC Accessibility Statement**

South Central College strives to make all learning experiences as accessible as possible. If you have a disability and need accommodations for access to this class, contact the Academic Support Center to request and discuss accommodations. North Mankato: Room B-132, (507) 389-7222; Faribault: Room A-116, (507) 332-5847.

Additional information and forms can be found at: [www.southcentral.edu/disability](http://www.southcentral.edu/disability)

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