South Central College

AST 1130 Introduction to Hybrid Electric Vehicles

Common Course Outline

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	Credits/Hours
Lecture	1/16

Pre/Corequisites

Prerequisite 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