

# NORTHEAST IOWA COMMUNITY COLLEGE

## Calmar/Peosta

**1.0 COURSE TITLE:** Hybrid, Electric, and Alternative Fuel Vehicles

**2.0 COURSE NUMBER:** AUT:192

**3.0 SEMESTER HOUR CREDIT:** 2

**4.0 LECTURE HOURS:** 24

**5.0 LAB HOURS:** \_\_16\_\_ **CLINICAL HOURS:** \_\_0\_\_ **COOP HOURS:** \_\_0\_\_

**6.0 COURSE DESCRIPTION:**

During this course students will learn the theory, application and service information of hybrid, electric and alternative power vehicles.

6.1 Prerequisite(s): AUT:191

6.2 Primary Common Learning Outcome: Critical Thinking

6.3 Bloom's Domain Level: Apply

**7.0 MAJOR COURSE OBJECTIVE:**

The students will be able to identify the operations, functions and service procedures of different types of hybrid/electric vehicles.

**8.0 EDUCATION LEARNING OUTCOMES (ELOs):**

8.1 Students will be able to identify the basics of a battery-operated electric vehicle.

8.2 Students will be able to identify the basics of hybrid and series type hybrid/electric vehicle operations.

8.3 Students will be able to identify the operation of mild and assist hybrid/electric vehicles.

8.4 Students will be able to identify the operation of power-split-type full hybrid/electric vehicles.

8.5 Students will be able to identify the design of different types of full hybrid/electric vehicles.

8.6 Students will be able to demonstrate basic hybrid/electric vehicle maintenance and service.

8.7 Students will be able to identify fuel cells and other alternative powered vehicles.

**9.0 UNITS:**

9.1 Unit One: Students will be able to identify the basics of a battery-operated electric vehicle.

Competencies:

At the end of this unit, students will be able to:

9.1.1 Identify the major systems that make up a BEV (Battery Electric Vehicle) and ICE (Internal Combustion Engine).

9.1.2 Identify the purpose and function of a battery control system.

- 9.1.3 Identify the difference between conductive and inductive battery charging.
- 9.1.4 Demonstrate the distinctiveness of driving an electric vehicle.
- 9.1.5 Apply safety precautions when troubleshooting and repairing an electric vehicle.

9.2 Unit Two: Students will be able to identify the basics of hybrid and series type hybrid/electric vehicle operations.

Competencies:

At the end of this unit, students will be able to:

- 9.2.1 Illustrate how hybrid/electric vehicles are more efficient.
- 9.2.2 Identify the basic differences between series and parallel hybrid/electric configurations.
- 9.2.3 Identify the importance of electronics in the operation of a hybrid/electric vehicle.
- 9.2.4 Articulate the differences between full, assist, and mild hybrid/electric vehicles.
- 9.2.5 Identify the primary advantage of plug-in hybrid vehicles.

9.3 Unit Three: Students will be able to identify the operation of mild and assist hybrid/electric vehicles.

Competencies:

At the end of this unit, students will be able to:

- 9.3.1 Identify the advantages of the stop-start features in hybrids.
- 9.3.2 Identify the difference between mild and assist hybrid/electric vehicles.

9.4 Unit Four: Students will be able to identify the operation of power-split-type full hybrid/electric vehicles.

Competencies:

At the end of this unit, students will be able to:

- 9.4.1 Articulate the difference between mild and full hybrid/electric systems.
- 9.4.2 Apply the components used in Toyota's hybrid/electric system.
- 9.4.3 Identify the operations of the two electric motors in Toyota's hybrids/electrics.
- 9.4.4 Identify the operations of the hybrid/electric system used by Ford Motor Company.
- 9.4.5 Articulate how manufacturers provide four-wheel drive to its hybrid/electric Sports Utility Vehicle (SUV).

9.5 Unit Five: Students will be able to identify the design of different types of full hybrid/electric vehicles.

Competencies:

At the end of this unit, students will be able to:

- 9.5.1 Apply the basic operations of Honda's full hybrids/electric vehicles.
- 9.5.2 Identify full hybrid/electric vehicles and operations that use an ISAD system.
- 9.5.3 Identify the operation of the two-mode hybrid/electric system.
- 9.5.4 Demonstrate the major differences between the powertrains of full hybrid/electric vehicles.

- 9.6 Unit Six: Students will be able to demonstrate basic hybrid/electric vehicle maintenance and service.

Competencies:

At the end of this unit, students will be able to:

- 9.6.1 Demonstrate the precautions for servicing hybrid/electric vehicles.
- 9.6.2 Demonstrate the tools and equipment that are needed to safely service and repair hybrid/electric vehicles.
- 9.6.3 Articulate how the manufactures have designed their hybrid/electric vehicles to ensure the safety of the passengers and technicians.
- 9.6.4 Identify the special considerations and procedures followed when servicing hybrid/electric vehicles: engine, cooling system, transmission, brake system, steering system, and air conditioning systems.

- 9.7 Unit Seven: Students will be able to identify fuel cells and other alternative powered vehicles.

Competencies:

At the end of this unit, students will be able to:

- 9.7.1 Identify the major components and configurations of a fuel cell vehicle.
- 9.7.2 Identify the different types of fuel cells currently being considered for use in vehicles.
- 9.7.3 Identify various technologies that can be incorporated into an internal combustion engine vehicle to make it more efficient.

## **10.0 INSTRUCTIONAL METHODS**

- 10.1 Teaching Essentials: Interactive lecture and guided discussion
- 10.2 Reflective and Integrative Learning: Peer Apply and self-evaluation
- 10.3 Collaborative Learning: Group and partnered projects
- 10.4 Active Learning: Problem-based projects
- 10.5 Use of Technology: Multi-meter devices. Automotive diagnostic machines

## **11.0 GRADING CRITERIA:**

- 11.1 Grades will be assigned for work completed using the letter grades A-F as identified in the college catalog.
- 11.2 The instructor will provide the grading criteria to students in the course syllabus and at the beginning of the course.

12/14, 1/22, 4/23