COURSE OUTLINE OF RECORD

**Number:** AUTO G170  
**TITLE:** Hybrid Vehicles

**ORIGINATOR:** Bryan Kramer  
**EFF TERM:** Fall 2008

**FORMERLY KNOWN AS:**

**CROSS LISTED COURSE:**

**DATE OF OUTLINE/REVIEW:** 02-19-2008

**TOP NO:** 0948.40

**SEMESTER UNITS:** 3.0

**HRS LEC:** 54.0  
**HRS LAB:** 18.0  
**HRS OTHER:** 0.0

**CONTACT HRS TOTAL:** 72.0

**STUDY NON-CONTACT HRS RECOMMENDED:** 108.0

**CATALOG DESCRIPTION:**

This course is a hands-on approach to the world of hybrid, fuel cell and electric powered vehicles. Discover how this new technology works as it replaces existing fossil fueled engines. Examine existing technologies, conversion processes, testing, assembly, operation, and maintenance of hybrid-electric, fuel cell and battery powered electric vehicles. Appropriate safety related instruction is included.

**JUSTIFICATION FOR COURSE:**

**PREREQUISITES:**

**COREQUISITES:**

**ADVISORIES:**

**ASSIGNED DISCIPLINES:**

  Automotive technology

**MATERIAL FEE:** Yes [ ] No [X] Amount: $0.00

**CREDIT STATUS:** Noncredit [ ] Credit - Degree Applicable [X] Credit - Not Degree Applicable [ ]

**GRADING POLICY:** Pass/No Pass [X] Standard Letter [X] Not Graded [ ] Satisfactory Progress [ ]

**OPEN ENTRY/OPEN EXIT:** Yes [ ] No [X]

**TRANSFER STATUS:** CSU Transferable[X] UC/CSU Transferable[ ] Not Transferable[ ]

**BASIC SKILLS STATUS:** Yes [ ] No [X]  
**LEVELS BELOW TRANSFER:** Not Applicable

**CALIFORNIA CLASSIFICATION CODES:** Y - Not Applicable

**NON CREDIT COURSE CATEGORY:** Y - Not applicable, Credit Course

**OCCUPATIONAL (SAM) CODE:** C

**REPEATABLE ACCORDING TO STATE GUIDELINES:** No [X] Yes [ ] NUMBER REPEATS:

**REQUIRED FOR DEGREE OR CERTIFICATE:** No [X] Yes [ ]

**GE AND TRANSFER REQUIREMENTS MET:**

**COURSE LEVEL STUDENT LEARNING OUTCOME(S) Supported by this course:**

1. Identify high voltage systems and components.

2. Analyze and diagnose automotive engines and related components for correct system operation.

3. Demonstrate mastery of diagnostic tools and equipment used for automotive repair.

4. Demonstrate an ability to self-assess progress and development in a specific area and to further design and pursue a course of action based on the self-assessment.
COURSE OBJECTIVES:
1. Illustrate advances that Electric Vehicles, which include hybrids, fuel cells, and other emerging electric vehicle technologies, bring to vehicular travel and emission reduction.
2. Identify key features of EV technology that meet existing transportation needs as well as environmental requirements today.
3. Examine the differences between "real" transportation performance requirement and what the general public "perceives" as their transportation performance requirements.
4. List the components of an EV by manufacturer.
5. Demonstrate safe methods of EV conversion, repair and operation.
6. Disassemble a completed EV and identify its components and their function.
7. Compare a disassembled EV to the vehicle to be converted and formulate plans for the conversion of an electric vehicle.
8. Re-assemble the disassembled EV to its original condition.
9. Properly use alternate fuel vehicle nomenclature.

COURSE CONTENT:

LECTURE CONTENT:

A. Safety issues with EVs
   1. High voltage
   2. Battery concerns
   3. Weight distribution
   4. Handling concerns
   5. Braking concerns
   6. Periodic maintenance

B. EV safety procedures
   1. Handling high voltage components
   2. Proper dress for safety
   3. Eye protection
   4. Hand protection
   5. Insulation
   6. Tool types and selection

C. Comparative analysis of EV conversions
   1. Internal combustion powered vehicles
   2. Original Equipment Manufacturer (OEM) - built EVs
   3. Fuel Cells
   4. Hybrid EV’s

D. Advantages and limitations of Electric Vehicles
   1. Operating range
   2. Fuel costs and savings
   3. Long term costs
   4. Component replacement
   5. Driveability
   6. Performance

E. Pre-construction evaluation of proposed EV and its components
   1. Selecting the correct platform
   2. Selecting the drive system
   3. Choosing AC or DC
   4. Analyzing cost versus performance
   5. Availability of materials
F. Disassembly of an electric vehicle
   1. Safety issues
   2. Documentation of disassembly procedures
   3. Selection of proper tools
   4. Do No Harm

G. Identification of EV systems and components, their locations and functions
   1. Motors
   2. Controllers
   3. Batteries and capacitors
   4. Wiring
   5. AC to DC converters
   6. Auxiliary systems
   7. Instrumentation
   8. Chargers

H. Identification of sources and types of components utilized in EVs
   1. OEM
   2. After-market
   3. Salvaged components
   4. Used parts market
   5. Aircraft surplus

I. Testing of systems and components

J. Design an EV
   1. Hybrid electric
   2. Fuel cell
   3. Conventional battery powered

K. Governmental regulations, standards and incentives related to EV owners
   1. Tax breaks
   2. Diamond lane
   3. Registration
   4. Smog Check

L. Introduction to systems upgrades for EV components

M. Acquisition and adaptation of EV conversion components and their installation

N. Testing and evaluation of EVs

O. Basic shop skills overview and development

P. Shop equipment and hand tool safety

LABORATORY CONTENT:

A. EV safety procedures
   1. Demonstrate the proper way to deactivate the vehicle's high amperage system.
   2. Perform vehicle deactivation and demonstrate proper start-up procedure after service.
   3. Explain the importance of proper grounding of technician to prevent electrical shock while servicing system.
   4. Explain importance of orange colored harness as a high voltage power supply.

B. Disassembly of EVs
   1. Demonstrate proper deactivation of vehicle's power supply.
   2. Explain importance of technician grounding to prevent electrical shock.
   3. Explain importance of proper tool use while performing electrical diagnostics. Some tools may supply current and damage integrated circuitry.
C. Identification of EV components

1. Perform component identification of components.
2. Describe function of components.
3. Demonstrate proper diagnosis of EV components.
4. Identify computer networking components.

D. Testing of Components

1. Demonstrate different test procedures for EVs compared to Hybrid vehicles.
2. Demonstrate different test procedures for Fuel Cell vehicles.
3. Demonstrate communication between vehicle's body and powertrain control modules.

METHODS OF INSTRUCTION:

A. Lecture:
B. Lab:

INSTRUCTIONAL TECHNIQUES:

COURSE ASSIGNMENTS:

Reading Assignments

Text
Websites - ase.com, natef.org, era.org

Out-of-class Assignments

Writing Assignments

1. Demonstrate ability to retrieve service information wiring diagrams and TSBs of a vehicle.
2. Demonstrate understanding of Ohm's Law by performing Voltage Drops in a circuit.
3. Demonstrate understanding in diagnostic and service principles of the starting, charging and battery circuits.

METHODS OF STUDENT EVALUATION:

Midterm Exam
Final Exam
Short Quizzes
Written Assignments
Objective Examinations
Report
Projects (ind/group)
Problem Solving Exercises
Oral Presentations
Skills Demonstration

Demonstration of Critical Thinking:

1. Analyze wiring diagrams to determine circuit faults.
2. Perform diagnosis and service to battery.
3. Perform diagnosis and service to starting, charging and lighting circuits.
4. Perform diagnosis and service to gauges and accessories circuits.
5. Perform diagnosis of vehicle's body and powertrain control modules.

Required Writing, Problem Solving, Skills Demonstration:

1. Demonstrate ability to retrieve service information wiring diagrams and TSBs of a vehicle.
2. Demonstrate understanding of Ohm’s Law by performing Voltage Drops in a circuit.
3. Demonstrate understanding in diagnostic and service principles of the starting, charging and battery circuits.
TEXTS, READINGS, AND RESOURCES:
   TextBooks:

LIBRARY:
   Adequate library resources include:

Comments:

Attachments:
   Attached Files