

# ADVANCED ELECTRIC DRIVE VEHICLES

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Project ID: ARRAVT039

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## Overview

### Timeline

- Project start date: DEC 2009
- Project end date: DEC 2012
- Percent complete: 35%

### Budget

- Total project funding
- DOE share: \$720,358

### Barriers

- Obtaining Instructional Equipment and Materials from Vendors

### Partners

- None



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## COMMUNITY NEED/MOTIVATING RATIONALE

There is a large and currently unmet need for automotive technicians with the skills necessary to service today's vehicles.

In Virginia alone, the Virginia Employment Commission has projected 862 openings for automotive technicians per year between 2006 and 2016.

(VA Employment Commission, 2008)



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## COMMUNITY NEED/MOTIVATING RATIONALE

Compounding this shortage is the fact that automotive technology is rapidly changing and many of today's technicians do not possess the requisite knowledge and/or skills to repair the newer vehicles.

With the introduction of advanced electronics, electric vehicles, plug-in hybrid electric vehicles, and fuel cell electric vehicles, there is a critical need for education in these new and emergent technologies.



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## COMMUNITY NEED/MOTIVATING RATIONALE

Today's automotive service technician must know how to safely diagnose and repair an inverter capable of converting DC voltage to 600V 3 phase AC voltage. Tomorrow's technician will also be required to diagnose and repair a Polymer electrolyte membrane (PEM) fuel cell.

An extensive search of course offerings by community colleges reveals only a few offering technician-level courses in advanced electric drive vehicles.

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## COMMUNITY NEED/MOTIVATING RATIONALE

Automotive manufacturers are currently the only organizations providing this advanced technology education to technicians. These manufacturers' courses are only available to technicians at dealerships that sell their products.

Virtually no education is available for non-manufacturer technicians. Hence, independent facilities, which greatly outnumber dealerships, must frequently tell their customers that they cannot repair their vehicles.



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## ADVANCED ELECTRIC DRIVE VEHICLE

### OBJECTIVES

Address the critical need for automotive technical education in new and emerging propulsion technologies:

- Hybrid Electric vehicles (HEV)
- Electric vehicles (EV)
- Plug-in hybrid electric vehicles (PHEV)
- Fuel cell electric vehicles (FCV)

By developing new courses and collating them into an advanced electric vehicle Career Studies Certificate.

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## SCOPE OF WORK

Develop and implement courses in the following technical areas:

- Principles of operation, diagnosis and repair of HEV, EV, PHEV, and FCV.
- Electronic control systems including sensors, controllers and other advance electronic components required for the operation of HEV, EV, PHEV, and FCV.
- Industrial safety as it applies to new and emerging technologies.

**Deliverable:** Development of five advanced electric drive vehicle courses.

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## TASKS TO BE PERFORMED

### Career Studies Certificate Curriculum:

JSRCC's Advanced Electric Drive Vehicle CSC will include the theory, application, and diagnosis of HEV, EV, PHEV, and FCV.

The CSC will be a sequence of 22 credits of which 19 will be in Advanced Electric Vehicles. The remaining course will be in humanities or the social sciences. The following courses are planned for development:

- AUT XXX "Introduction and Safety", 3 lecture, 3 credits
- AUT XXX "Electric Vehicles" 3 lecture, 3 lab, 4 credits
- AUT XXX "Plug-in Hybrid Vehicles" 3 lecture, 3 lab, 4 credits
- AUT XXX "Fuel Cell Electric Vehicles" 3 lecture, 3 lab, 4 credits
- AUT XXX "Control Electronics" 3 lecture, 3 lab, 4 credits
- Humanities/Social Sciences elective 3 lecture, 3 credits

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## TASKS TO BE PERFORMED

Two courses have been developed during the first year of the grant (2010) :  
(1) the introduction and safety course and (2) the electric vehicle course.

The plug-in hybrid electric vehicle course will be developed in Year 2 (2011)

The fuel cell electric vehicle and control electronics courses will be developed in Year 3 (2012).

Each of the AUT courses will be developed in the following phases with each phase requiring approximately one semester:

- Develop course
- Develop laboratory exercises
- Pilot course in traditional classroom format
- Refine course and convert to a distance education format

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## Project Management Plan

### Introduction to Hybrid Automotive Technology and Safety

Develop Course	Fall 09
Develop Laboratory Exercises	Fall 09
Pilot Course	Fall 09
Refine Course	Spring 10
Offer Full Developed Course	Summer 10

- Introduction & Safety Course Development Completed
- Course has been offered in traditional classroom format and in distance education format

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## Project Management Plan

### Electric Vehicles

Develop Course	Spring 10
Develop Laboratory Exercises	Spring 10 - Summer 10
Pilot Course	Fall10
Refine Course	Spring 11
Offer Full Developed Course	Summer 11

- Electric Vehicle Course Development Completed
- Course has been offered in traditional classroom format and will be developed and offered in distance education format in Summer 2011

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## Project Management Plan

### Plug-In Hybrid Vehicles

Develop Course	Fall 10	
Develop Laboratory Exercises	Spring 10	
Pilot Course		Summer 11
Refine Course		Fall 11
Offer Full Developed Course		Spring 12

- Plug-In Hybrid Vehicle Course Development Completed
- Pilot Course in traditional classroom format will be offered in Summer 2011

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## Project Management Plan

### Fuel Cell Electric Vehicles

Develop Course	Summer 11
Develop Laboratory Exercises	Fall 11
Pilot Course	Spring 12
Refine Course	Summer 12
Offer Full Developed Course	Fall 12

- Fuel Cell Electric Vehicle Course will be developed in Summer 2011
- Pilot Course in traditional classroom format will be offered in Spring 2012

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## Project Management Plan

### Control Electronics

Develop Course	Summer 11
Develop Laboratory Exercises	Fall 11
Pilot Course	Spring 12
Refine Course	Summer 12
Offer Full Developed Course	Fall 12

- Control Electronics course will be developed in Summer 2011
- Pilot Course in traditional classroom format will be offered in Spring 2012

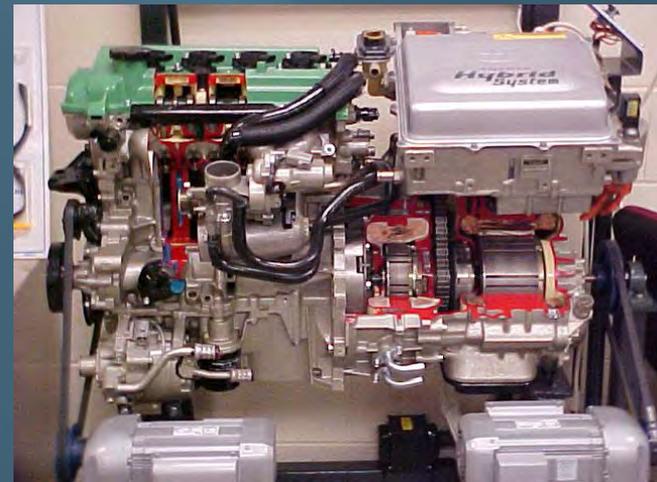
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## Collaborations

Academic collaborations include: City College of San Francisco, with the development of electric vehicle instruction and the development of automotive electronics instruction.

Industrial partners for JSRCC automotive program include:

Ford, General Motors,  
Bridgestone-Firestone,  
CarMax, AC Delco,  
and Hunter Engineering.



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## Project Management Plan

### Summary of Accomplishments

- Completed development of Hybrid vehicle Introduction & Safety course.
- Hybrid vehicle Introduction & Safety course has been offered in traditional classroom format and distance education format.
- Completed development of Electric Vehicle course.
- Electric Vehicle course has been offered in traditional classroom format.
- Electric Vehicle course is being developed in distance education format.
- Plug-In Hybrid course has been developed.
- Plug-In Hybrid course is scheduled in traditional classroom format for Summer 2011.
- Initiated purchasing of instructional equipment for Plug-In Hybrid course.

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## Questions?

