Las Positas College
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Course Outline for AUTO 64

ALTERNATIVE FUEL SYSTEMS

Effective: Fall 2008

I. CATALOG DESCRIPTION:
AUTO 64 — ALTERNATIVE FUEL SYSTEMS — 4.00 units

A study in the history, current and future of alternative fuels in the automotive industry. Emphasis in shop safety, hazardous waste handling, high voltage electrical precautions, basic engine construction of hybrids, battery storage systems, fuel storage systems, compressed natural gas, liquid propane gas, bio-diesel and hydrogen cell technology. A term paper will be required for completion of the class. Students are strongly recommended to enroll in Automotive Lab concurrently. Prerequisite: Auto 55 (may be taken concurrently).

3.00 Units Lecture 1.00 Units Lab

Prerequisite
AUTO INTR - Automotive Service and Introduction

Strongly Recommended
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Grading Methods:
Letter or P/NP

Discipline:

	MIN
Lecture Hours:	54.00
Lab Hours:	54.00
Total Hours:	108.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 3

III. PREREQUISITE AND/OR ADVISORY SKILLS:

Before entering the course a student should be able to:

A. AUTOINTR

IV. MEASURABLE OBJECTIVES:

Upon completion of this course, the student should be able to:

A. describe the importance of shop safety relating to different alternative fuels;
B. explain the importance of implementation of alternative fuels;
C. identify and perform safety procedures in regards to the handling of alternative fuels and battery disposal;
D. . access and research service information stored on computer;
E. specify and list the differences in alternative fuels;
F. distinguish and compare the different Hybrid fuel systems;
G. use critical thinking skills to explore the future of alternative fuels.
H. maintain a clean and professional environment.

V. CONTENT:
A. Shop safety when dealing with alternative fuels.
    1. Proper attire.
        a. Manufacturer and Government
    2. Fire Hazards, what to do and how to respond.
    3. Cautionary Colors
        a. Under 50 Volts
        b. 50 to 100 Volts
        c. Over 100 Volts.
B. Alternative Fuel Government regulations and implementation.
    1. History and future of Alternative Fuel regulations.
    2. Laws, domestic and international governing alternative fuels.
    3. Gasoline supply and pricing.

a. How much is left?
b. Middle east Stability
c. OPEC

4. Fueling station availability.
   a. Gasoline
   b. Bio-Diesel
   c. CNG
   d. LPG
   e. Propane

C. Safety and Handling of alternative fuels and battery systems.
1. Occupational Safety Health Administration (OSHA) Shop standards applied.
2. Flash points of different fuels.
3. Hazardous material handling; CNG, LPG, Bio-Diesel, Batteries, Hydrogen cell, as well as other chemicals related to the automobile and alternative fuels.

D. Service information.
1. Access Computer based service information; Alldata, Mitchell on demand as well as Manufacturer information systems as available.

E. Automotive Alternative Fuels Systems.
1. Ethanol systems and blends.
   a. Major Manufacturing Changes
   b. Effects on internal engine components
   c. Effects on fueling systems
2. CNG systems and blends.
   a. Major Manufacturing Changes
   b. Effects on internal engine components
   c. Effects on fueling systems
3. LPG systems and blends.
   a. Major Manufacturing Changes
   b. Effects on internal engine components
   c. Effects on fueling systems
4. Bio-Diesel systems and blends.
   a. Major Manufacturing Changes
   b. Effects on internal engine components
   c. Effects on fueling systems
5. Electrical motor and solar systems.
   a. Motor Technology Challenges
   b. Solar Technology Challenges
   c. Battery Technology Challenges
      1. Lead acid
      2. Ni-Cd
      3. Ni-Mh
      4. Lit-Ion
      5. Lit-Ion gel
      6. Coming Technology
6. Hydrogen Cell systems
   a. Hydrogen Technology Challenges
   b. Hydrogen Supply and rendering

F. Hybrid Fuel Systems.
1. Gasoline-Electric systems.
2. Gasoline-CNG systems.
3. Gasoline-LPG systems.

G. Future of Alternative Fuels systems.
1. Advances in Technology.
2. What's next?
3. Challenges new fuels have.

H. Professional environment
1. Safety glasses (Clear lenses) worn in all Laboratory areas.
2. No loose clothing (Coveralls strongly recommended).
3. Long Hair secured.
4. No open toe shoes (safety shoes recommended).
5. Work areas maintained; clean free of debris and spills.

VI. METHODS OF INSTRUCTION:
A. **Lecture** -
B. **Discussion** - Group discussions.
C. **Lab** - Student Hands-on laboratory activities and assignments.
D. **Audio-visual Activity** - 1. PowerPoint presentations. 2. Mockup parts from automobile.

VII. TYPICAL ASSIGNMENTS:
A. Lecture based assignments. 1. Text reading. i. Read chapter 10 in Alternative Fuels, An Overview ii. Read supplied article from internet website of current events of alternative fuels. 2. Oral presentation. i. Two groups will be created. Group A will present to the class why CNG is a better alternative than LPG. Group B will present why LPG is better than CNG. 3. Class discussion. i. After oral presentation the class will discuss the pro's and con's of both. ii. Class will interact with each other on the future of oil supply. 2. Lab based assignments. 1. Instructor led and observed lab activity. i. Instructor will demonstrate how to pressure test a CNG tank and then observe students performing task. 2. Student led, Instructor observed lab activity. i.Instructor will lecture on testing a hybrid battery system and then observe student following a lab sheet. 3. Writing Based Assignments. 1. Term Paper. i. In 1000 words or more write a paper on "How Alternative Fuels affect me." ii. In 1000 words or more write a paper on "Why the future of Alternative Fuels should be expanded."

VIII. EVALUATION:
A. **Methods**

1. Exams/Tests
2. Quizzes
3. Class Participation
4. Home Work

B. **Frequency**

IX. TYPICAL TEXTS:

1. Jack Erjavec, Jeff Arias *A. Hybrid, Electric & Fuel-Cell Vehicles.* 1st Ed ed., Thomson Delmar Publishing, 2006.
2. Safety glasses (clear lenses)

X. OTHER MATERIALS REQUIRED OF STUDENTS: