

Las Positas College
3000 Campus Hill Drive
Livermore, CA 94551-7650
(925) 424-1000
(925) 443-0742 (Fax)

Course Outline for APAU 97J

ADV. DIAG/TROUBLE SHOOTING SYS

Effective: Fall 2009

I. CATALOG DESCRIPTION:

APAU 97J — ADV. DIAG/TROUBLE SHOOTING SYS — 4.00 units

Advanced fuel and emissions systems building on previous knowledge base with an emphasis on diagnosis of electronic problems including computer controlled circuits/systems using schematics, diagnostic procedures and equipment. Students are encouraged to enroll in Automotive Lab concurrently. Only students who are part of the automotive apprenticeship may enroll in an APAU class. 3 hours lecture, 3 hours laboratory.

3.00 Units Lecture 1.00 Units Lab

Grading Methods:

Discipline:

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

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 4

III. PREREQUISITE AND/OR ADVISORY SKILLS:

IV. MEASURABLE OBJECTIVES:

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

1. obtain and interpret scan tool data, retrieve and record stored On Board Diagnostics (OBD) diagnostic trouble codes, and other On Board controllers
2. diagnose the causes of electrical failures or concerns resulting from malfunctions in the computerized control systems with or without diagnostic trouble codes
3. chart, inspect and test computerized engine control system sensors, Powertrain control module (PCM), actuators, and circuits using a graphing multi-meter (DMM)/digital storage oscilloscope (DSO), and perform necessary action
4. access and use service information to perform step-by-step diagnosis
5. evaluate complex electrical system problems
6. develop diagnostic paths using wiring schematics
7. diagnose malfunctions of electronic control systems causing vehicle performance problems, and determine necessary action
8. outline hazardous waste handling
9. maintain a clean professional environment

V. CONTENT:

- A. On Board computer scan data
 1. Retrieval of codes and data
 - a. Flash codes
 - b. Scanner codes
 2. Interpretation of information
 - a. Factory set procedures
 - b. Develop own diagnostic procedures
- B. Emission system diagnostics and testing
 1. Perform flow chart testing, with codes, and without codes
 2. Evaluate exhaust gas emission smog test results
 3. Electronic pulse with modulation evaluation
- C. Diagnostic patterns, and analyze scope readings
 1. Digital storage oscilloscope usage
 - a. Scope connection
 - b. Pattern interpretation
- D. Diagnostic service information
 1. Access service information (electronic)
 - a. Application of information
 2. Access service information (paper)
 - a. Application of information
 3. Research labor time guides for work determined in diagnostics
- E. Ignition timing

1. Inspection of adjustable systems
 - a. Proper operation of timing light
 - b. Follow factory procedures
 - c. Set timing to specifications
- F. Explain theory and functionality of "OPEN/CLOSED loop systems
 1. List theory of fuel flow delivery system in open loop status
 - a. Sensor contribution at operating temperatures
- G. Exhaust system evaluation
 1. Back pressure
 - a. Testing and diagnosis
 2. Installation inspection
- H. Emissions and performance
 1. Explain impact of emissions system on vehicle performance
 - a. Diagnoses of power systems
- I. Valve adjustments
 1. Adjustment of hydraulic and solid lifters
- J. Dynamometer
 1. Set up and use of dynamometer
 2. Safety procedures
 3. List dynamic information obtained from testing (loaded mode)
- K. Handling of hazardous waste materials
 1. Storage and handling of gasoline
 2. Storage and handling of diesel fuel
- L. Professional environment
 1. Safety glasses (clear lens) 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. **Audio-visual Activity** - PowerPoint presentations Mockup parts from automotive
- C. **Lecture** -
- D. **Discussion** - Group discussion
- E. **Lab** - Student Hands-on laboratory activities and assignments

VII. TYPICAL ASSIGNMENTS:

A. Lecture based assignments 1. Text reading 2. Oral presentation 3. Class discussion B. Lab based assignments 1. Completion of applied activities 2. Lab activity worksheet 3. Diagnosis and debugging C. Student Lab work sheets with emphasis on Hands-on applications D. Review of Lab sheets in both Lab and class settings E. Text reading assignments F. Class discussions of reading assignments G. Demonstrations pertaining to reading assignments

VIII. EVALUATION:

A. **Methods**

1. Exams/Tests
2. Quizzes
3. Home Work
4. Lab Activities
5. Other:
 - a. Performance of Lab projects demonstrating understanding of theories
 - b. Homework assignment completion
 - c. Lab assignments from text and instructor categorizing faults and operations
 - d. Professionalism of student in shop practices, including safety, maintenance of work areas, and customer service
 - e. Quizzes: Midterm and Final examination
 1. Typical exam questions:
 - a. The fuel pressure regulator has the vacuum hose removed on a 1999 Chevy Camaro. What should occur when it is reconnected?
 1. The fuel pressure should go down
 2. The carbon monoxide should go down
 3. Both 1 and 2
 4. Neither 1 or 2
 - b. On a four-gas analyzer a gas reading with high HC and high CO what is the most likely cause?
 1. A vacuum leak is present
 2. High fuel pressure is the problem
 3. Low fuel pressure in evident
 4. The unit has an ignition miss

B. **Frequency**

1. Weekly Quizzes
2. Weekly Lab Assignments
3. Midterm
4. Final

IX. TYPICAL TEXTS:

1. Hollembeak, Barry *Automotive Fuels & Emissions Classroom Manual.*, Thomson Delmar Learning, 2005.
2. Hollembeak Barry *Automotive Fuels & Emissions Shop Manual.*, Thomson Delmar Learning, 2005.
3. James d. Halderman *Advanced Engine Performance Diagnosis.* 3rd ed., Prentice Hall, 2006.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

- A. Safety Glasses