

Las Positas College
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Course Outline for APAU 97U
ENGINE PERFORMANCE SYSTEMS
Effective: Fall 2009

I. CATALOG DESCRIPTION:

APAU 97U — ENGINE PERFORMANCE SYSTEMS — 1.50 units

This is a Bureau of Automotive Repair approved alternative to the ASE A-8 certification required for obtaining and maintaining smog technician licenses. This course focuses on basic engine theory and testing, smog cause and effect, fuel systems, emission control systems, computerized engine control systems, ignition systems, and diagnostics. Industry Advisory: Students entering the course are expected to have a firm background in automotive engine theory and operation. In order to be eligible to take the State Licensing Exam at completion of the course/program, they must also have one year trade experience in engine performance/emissions, or nine semester units (13 quarter units) in Automotive Technology, or 180 hours at an accredited automotive school. Only students who are part of the automotive apprenticeship may enroll in an APAU class. 1 hours lecture, 1.5 hours laboratory.

1.00 Units Lecture 0.50 Units Lab

Grading Methods:

Discipline:

	MIN
Lecture Hours:	18.00
Lab Hours:	27.00
Total Hours:	45.00

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. explain and apply four cycle engine theory including compression, air, fuel, ignition, vacuum, and the interaction between them
2. explain and apply fuel management theory, testing, and diagnosis including computerized controls
3. explain and apply ignition theory, testing and diagnosis including use of an ignition scope and diagnosis of emissions problems caused by the ignition system
4. explain and apply on board computer theory, testing, and diagnosis including demonstrated use of a scan tool and diagnostic trouble code deciphering

V. CONTENT:

- A. Four cycle engine theory, testing, and diagnosis
 1. Four Cycle Theory
 2. Ignition Timing
 3. Fuel Timing
- B. Fuel management theory, testing, and diagnosis
 1. Carburation
 2. Fuel Injection
 3. Testing
- C. Ignition theory, testing, and diagnosis
 1. Points
 2. HEI
 3. DIS
 4. Coil over/near Plug
- D. On board computer theory, testing, and diagnosis
 1. Scanner Definitions
 2. Scanner Usage
 3. Voltage Testing of Sensors

VI. METHODS OF INSTRUCTION:

- A. **Lecture** -
- B. **Lecture** -
- C. **Lab** - Hands-On Lab Exercises
- D. **Audio-visual Activity** - Audio Visual presentations

E. Discussion -

VII. TYPICAL ASSIGNMENTS:

A. Read each chapter in the text and be prepared to seek clarification and ask questions in class. B. Orally discuss the material covered in each chapter C. Complete the review questions and related lab exercises for each chapter 1. What is the ration of an ideal or stoichiometric air/fuel ratio? 2. When the air/fuel mixture is correct for the current engine speed and load, the computer (PCM) will ground the mixture control solenoid ____% of the time in order to maintain proper fuel control. D. Complete lab activity worksheets for diagnosis of emission, ignition, or fuel problems using emissions analyzer, compression gauge, and ignition scope 1. Use an ignition scope to monitor oxygen sensor voltage and explain the meaning of the results when compared to manufacturer's specifications. 2. Perform a propane enrichment test while monitoring oxygen sensor voltage and explain the results.

VIII. EVALUATION:

A. **Methods**

1. Exams/Tests
2. Class Participation
3. Lab Activities
4. Other:
 - a. Passing the final exam with a minimum of 70% correct
 - b. Demonstrating competency when performing required lab assignments
 - c. Meeting mandatory participation criteria
 - d. Exhibiting appropriate effort regarding shop safety and class participation

B. **Frequency**

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

IX. TYPICAL TEXTS:

1. S. Myron Maurseth *Engine Performance.*, California Institute of Automotive Technology (CIAT), 2003.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

- A. Safety glasses – required
- B. Slip resistant, steel-toed boots – strongly recommended