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

Course Outline for APAU 97P

ADVANCED ENGINE PERFORMANCE

Effective: Spring 2017

I. CATALOG DESCRIPTION:
APAU 97P — ADVANCED ENGINE PERFORMANCE — 1.50 units

This is a Bureau of Automotive Repair approved alternative to the ASE L-1 certification required for obtaining and maintaining smog technician licenses. This course focuses on systematic diagnosis and repair of drivability and emissions problems. Students will gain an in dept understanding of compression, ignition, fuel, air, and vacuum as well as a good working knowledge of diagnostic procedures involved in diagnosing and repairing computer controlled engines. Industry Advisory: Successful completion of the Basic Clean Air Car Course is required to enroll in this class. In order to be eligible to take the State Licensing Exam at completion of the course/program, students 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. 1.5 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: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

IV. MEASURABLE OBJECTIVES:

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

1. thoroughly understand and explain four cycle engine basics: compression, ignition, fuel, air, and vacuum
2. use an emissions gas analyzer, scanner, and Digital Storage Oscilloscope and apply test results to aid in diagnosing a vehicle
3. explain the function of sensors and actuators and their interaction with the computer as well as proper diagnostic procedures for each
4. explain and demonstrate the theory and proper diagnostic procedures for understanding of how long and short term fuel trim work
5. correctly diagnose emissions control system failures
6. Retrieve, interpret, and apply diagnostic trouble codes
7. Demonstrate an understanding and use common industry terminology and abbreviations related to the course material

V. CONTENT:
- A. Four cycle engine basics: compression, ignition, fuel, air, and vacuum
- B. Operation of diagnostic tools: DSO, scanner, and emissions analyzer
  1. SO explanation
  2. DSO usage
  3. Scanner usage
  4. 4 gas analyzer usage
  5. 5 gas analyzer usage
- C. Function of sensors and actuators, their interaction with the PCM, and their effect on drivability and emissions
  1. Sensor relations to HC, CO, NOX
  2. Actuators relations to HC, CO, NOX
- D. Theory and diagnostic procedures for injected and carbureted fuel control systems
- E. Diagnosing emission control system failures
  1. HC Failures
  2. CO Failures
  3. NOX failures
- F. OBD II diagnostics and diagnostic trouble codes
  1. 4 digit codes
  2. Emissions related codes
  3. Non-emission related codes
- G. Industry and BAR terminology, abbreviations, standards, and procedures

VI. METHODS OF INSTRUCTION:
- A. **Lecture** -
- B. **Discussion** -
- C. **Lecture** -
- D. **Lab** - Hands-On Lab Exercises
- E. **Audio-visual Activity** - Audio Visual presentations

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 14. A bad exhaust gas recirculation valve will most like cause a vehicle to fail a loaded mode emissions test for what gas? 15. What is the main difference between a Titanium oxygen sensor and a Zirconium oxygen sensor? D. Complete lab activity worksheets for diagnosis of emission, ignition, OBD II, or fuel problems using emissions analyzer, DSO, and scan tool. 1. Use a Digital Storage Oscilloscope to monitor the mixture control solenoid signal generated by the computer in order to determine if the air/fuel mixture is rich or lean 2. Monitor emissions gases on a 5-Gas analyzer and compare results to the previous exercise. Explain any differences in the appearance of a rich or lean condition.

VIII. EVALUATION:
- A. **Methods**
  1. Exams/Tests
  2. Class Participation
  3. Lab Activities
  4. Other:
     1
- B. **Frequency**

  1

IX. TYPICAL TEXTS:
1. S. Myron Maurseth *Systematic Diagnosis & Repair Procedures.*, California Institute of Automotive Technology, 2003.

X. OTHER MATERIALS REQUIRED OF STUDENTS:
- A. Safety glasses – required
- B. Slip resistant, steel-toed boots – strongly recommended