

PALOMAR COLLEGE
COURSE OUTLINE OF RECORD FOR
DEGREE CREDIT COURSE

_____ Transfer Course A.A. Degree applicable course
(check all that apply)

COURSE NUMBER AND TITLE: AT-145 Auto Emissions, Diagnosis, Driveability, and Repair

UNIT VALUE: 3

MINIMUM NUMBER OF SEMESTER HOURS: 96

BASIC SKILLS REQUIREMENTS: Appropriate language and computational skills.

ENTRANCE REQUIREMENTS

PREREQUISITE: None

COREQUISITE: None

RECOMMENDED PREPARATION: None

SCOPE OF COURSE:

Auto emissions diagnosis and repair using an individual baseline approach and loaded-mode testing equipment to solve emission failures. Includes use of scan tools, digital storage oscilloscopes, and inflight analyzers to logically repair the vehicles.

SPECIFIC COURSE OBJECTIVES:

The students will:

1. Develop a critical path diagnostic procedure for vehicles that fail the California smog check BAR 97 emissions test.
2. Select and follow flow charts that lead to successful repairs.
3. Perform repair procedures using baseline testing as a starting point.
4. Use loaded mode testing and 4/5-gas analysis to duplicate failure events.
5. Operate various scan tools to evaluate emission systems.

6. Compare and contrast patterns of essential components using a digital storage oscilloscope.
7. Evaluate emission components as to their role in the failure event.
8. Apply principles of shop safety.

CONTENT IN TERMS OF SPECIFIC BODY OF KNOWLEDGE:

I. Loaded Mode Emission Testing (overview lecture)

- A. Basic theory of operation
 1. Description of dynamometer testing
 2. Description of steady state loaded mode
 - a. Acceleration Simulation Mode (ASM)
 - b. 50/15 and 25/25
- B. Operation of equipment
 1. ASM dynamometer and software
 2. 4/5 gas analyzers
 3. Scan tools and digital storage oscilloscopes

II. Diagnosis of loaded mode failures

- A. Evaluation of Vehicle Inspection Report (VIR) to formulate basic diagnostic plan
 1. Tampering (missing, modified, or disconnected) MMD
 2. Functional test failures (evap, timing, egr)
- B. Hydrocarbon (HC) failures
 1. Misfire
 - a. Mechanical
 - b. Electrical
 - c. Vacuum leaks
 2. Catalytic converter
 - a. Free flow
 - b. Temperature data
 - c. Age and mileage
- C. Carbon Monoxide (CO) failures
 1. Rich fuel control
 - a. Evaporative canister purge
 - b. Fuel pressure
 - c. Injector tests
 2. Air injection function
 - a. Volume
 - b. Controls
 3. Catalytic converter
 - a. Free flow
 - b. Temperature data
 - c. Age and mileage

- D. Oxides of Nitrogen (NO_x) failures
 1. Causes of excessive NO_x emissions (lean air/fuel, over advanced timing, inoperative emission components, inadequate cooling, etc.)
 2. Relationship to NO_x to other pollutants (HC, CO, CO₂)
- E. Preparing repair estimate for emission failures
 1. Practice repair scenario
 2. Explaining to the owner
 3. Writing the repair estimate
 4. Securing the authorization for repair

III. Repair Plan and Verification

- A. Baseline emission tests
 1. Diagnostic documentation
 2. Procedures for visual inspection
 3. Loaded mode baseline event
- B. Oxygen sensor baseline technique for correct fuel control
 1. Set-up of Digital Storage Oscilloscope (DSO)
 2. Evaluation of wave forms
 3. Demonstration of DSO operation for diagnosis
 4. “Hands-on” student demonstrations
- C. Diagnostics of non-feedback systems and non-data stream computerized vehicles
 1. Procedures for diagnosis of non-feedback systems
 - a. Engine tests
 - b. Emissions systems test
 2. Procedures for diagnosis of non-data stream computerized
 - a. Scan tool diagnosis
 - b. Trouble tree diagnosis
 3. Procedures for non-data stream fuel injection testing
- D. Vehicle on-board computer system data stream evaluation
 1. Customized scan tool diagnosis
 2. Evaluation of information and data retrieval
 3. Data stream storage and retrieval procedures
- E. Catalytic converter efficiency tests
 1. Four or five gas analyzer check of catalyst action
 2. Procedure for restriction test
 3. Demonstration of catalyst contamination and recovery

IV. Repairs and Driveability Service

- A. Replace needed parts
- B. Retest on loaded mode tester
- C. Road test for real world verification
- D. Run after repairs ASM test

REQUIRED READING: Texts appropriate for the course, such as the following:

Escalambre, Rick. A Technicians Guide to Advanced Automotive Emission Systems. New York: Delmar Publishers, 1995.

Halderman, James D., Chase D. Mitchell, Jr. and Corey W. Glassman. Advanced Engine Performance Diagnosis. New Jersey: Prentice Hall, 1998.

SUGGESTED READING: None

REQUIRED WRITING: Students will be assigned written homework weekly. These assignments are to be completed with short written answers as indicated in the course syllabus.

OUTSIDE ASSIGNMENTS:

Students are expected to spend a minimum of three hours per unit per week in class and on outside assignments, prorated for short-term classes.

Students will be assigned to take the ASE tests in Auto Electricity (A6) and Auto Engine Performance (A8)

INSTRUCTIONAL METHODOLOGY:

Check all that apply:

- lecture
- laboratory
- lecture-laboratory combination
- directed study

DISTANCE LEARNING:

This course may be offered as a distance learning course and meets Title 5 regulations 55370, 55372, 55374, 55376, 55378, and 55380.

Yes No

If yes, check all that apply:

- Television Course (Video one-way, e.g. ITV, video cassette, etc.)
- Online Course (Text one-way, e.g. newspaper, correspondence, electronic file, etc.)
- Two-Way Video Conferencing (Two-way interactive video and audio)
- One-Way Video Conferencing (One-way interactive video and two-way interactive audio)
- Computer Assisted Instruction (A specialized form of mediated instruction relying primarily on student access to information and prepared lessons or teaching materials through a computer terminal, but not under immediate supervision of a qualified instructor.)

GRADING POLICY AND STANDARDS (include methods of determining whether the stated objectives have been met by students):

| | |
|--------------------------------|------------|
| Attendance/Written Assignments | 25% |
| Chapter Exams | 25% |
| Lab Participation | 25% |
| Final Exam | <u>25%</u> |
| Total | 100% |

- 90 - 100 = A
- 80 - 89 = B
- 70 - 79 = C
- 60 - 69 = D
- 0 - 59 = F

IS COURSE REPEATABLE FOR REASON(S) OTHER THAN DEFICIENT GRADE?

Yes No Number of times course may be taken for credit: 1

If yes, identify specific provision of Title 5 Division 2 section(s), 55761-55763 and 58161 which qualifies course as repeatable:

CONTACT PERSON: Clifford G. Meyer, Assistant Professor, Automotive Technology Department, X2249

SIGNATURES ON FILE