I. OVERVIEW

The following information will appear in the 2009 - 2010 catalog

AUTEC 373 Clean Air Car Course

Formerly listed as: AUTEC - 373: 97 B.A.R. Clean Air Course

This course is California Bureau of Automotive Repair approved for the basic (EB) and enhanced (EA) emission control licenses. It is designed especially for the automobile technician preparing for the California Smog License. Students who do not have one year of trade experience in emissions/tune-up or required courses and certificates will not be eligible to take the state licensing examination. Emphasis will be on operational principles of the emission control components and how to test them. B.A.R. requires a minimum of 90% attendance and 70% (C) grade for completion.

Prerequisite: Satisfactory completion of AUTEC 320.

Advisory: Before enrolling in this course, students are strongly advised to Contact the instructor teaching the class.

Materials Fee Required

Three maximum completions.

Field trips are not required. Units/Hours: 5.00 Units: Lecture - 72.00 hours Lab - 54.00 hours

Grading: A-F or P/NP - Student choice

II. LEARNING CONTEXT

Given the following learning context, the student who satisfactorily completes this course should be able to achieve the goals specified in Section III, Desired Learning:

A. COURSE CONTENT

1. Required Content:

   a. Rules and Regulations

      i. Program description and goals

      ii. Definition and requirements for licensing stations

      iii. Requirements for licensed inspectors

      iv. Requirements for Smog Check Technicians

      v. Referee stations, referrals and actions

      vi. Quality assurance audits

      vii. Emission control system warranty

   b. Identification of vehicle and emission controls

      i. Identification of various makes, models, engine family and transmission types

      ii. Identification procedures for required vehicle emission control systems

      iii. Identification of "grey market" vehicles, and Bureau procedures for testing/referral

      iv. Bureau policy and testing procedures regarding engine changes and engine replacements
v. Identification of approved aftermarket emission control equipment

c. Basic electricity
   i. Ability to utilize Ohm's law in problem solving
   ii. Circuit construction, components and protection devices
   iii. Circuit faults

d. Wiring diagrams
   i. Locate and interpret wiring diagrams

e. Vacuum diagrams
   i. Vacuum circuit tracing procedures
   ii. Procedures to detect vacuum leaks

f. Smog - Cause and effect
   i. Combustion process in internal combustion engine
   ii. Federal and state efforts to control air pollutants from vehicles
   iii. Geographical and atmospheric conditions that contribute to formation of smog

g. Engine theory
   i. Engine construction and components
   ii. Cycles of operation
   iii. Combustion chamber design
   iv. Valve timing

h. Ignition systems
   i. Components, construction and theory of operation of distributor and distributor-less systems
   ii. Effects of ignition system faults on engine operation

i. Fuel systems
   i. Components, construction and theory of operation of carburetor and fuel injection systems
   ii. Effects of fuel system faults on engine operation
   iii. Characteristics of fuels

j. Emission systems
   i. Components, construction and theory of operation emission system
ii. Effects of emission system faults on engine operation

2. **Required Lab Content:**

a. Selection and correct use of various automotive test equipment to include:
   i. Meters
   ii. Scanners
   iii. Scopes
   iv. Exhaust gas analysers
   v. Chassis dynamometer
   vi. Fuel cap tester
   vii. Low pressure fuel evaporative tester

b. Engine condition diagnosis
   i. Perform a compression test
   ii. Perform a cylinder balance test
   iii. Perform a cylinder leakage test
   iv. Perform a vacuum test
   v. Test on-board computer systems, actuators and sensors
   vi. Test computer timing systems
   vii. Test fuel injection systems
   viii. Test distributor-less ignition systems

c. Exhaust gas analysers
   i. Troubleshoot engine performance problems using a gas analyser

d. Emission systems
   i. Perform a visual inspection of emission control systems for completeness and approved parts
   ii. Perform a functional test of the exhaust gas recirculation system, ignition timing and check engine light
   iii. Perform an initial/after repair test following Bureau procedures
   iv. Interpret Vehicle Inspection Report (VIR)
   v. Diagnose and repair Smog Check inspection failures and driveability problems correctly
   vi. Perform complete smog check using a dynamometer
B. ENROLLMENT RESTRICTIONS

1. **Prerequisites**
   
   Satisfactory completion of AUTEC 320.

2. **Advisories**
   
   Before enrolling in this course, students are strongly advised to contact the instructor teaching the class.

3. **Requisite Skills**

   *Before entering the course, the student will be able to:*

   a. Describe the principles governing electricity and magnetism.

   b. Analyze simulated troubleshooting problems using electronic test equipment.

4. **Health and Safety Skills/Restrictions**

   *Before entering the course, the student must demonstrate the following skill or condition:*

   a. Apply safe working practices during lab exercises.

C. **HOURS AND UNITS**

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D. **METHODS OF INSTRUCTION (TYPICAL)**

   *Instructors of the course might conduct the course using the following method:*

1. Related technical material will be presented through designated class lecture and lab demonstrations.

2. Guest speakers from the automotive industry will present technical seminars on specific automotive systems.

3. Student work performed in the laboratory will reinforce the lecture, demonstration, and seminar information.

4. Visual aids from automotive manufacturers and aftermarket suppliers will be used to clarify technical information.

5. Students will demonstrate mastery of each competency by the successful completion of a related lab project.

6. Students will be required to complete a written evaluation of data collected and compare the results with manufacturer specifications.

7. Given a component or a test vehicle, students will be required to follow a specific troubleshooting technique to locate a problem. Upon locating the problem, they will be required to repair or bring the unit within the parameters specified by the manufacturer.
E. ASSIGNMENTS (TYPICAL)

1. **EVIDENCE OF APPROPRIATE WORKLOAD FOR COURSE UNITS**
   Time spent on coursework in addition to hours of instruction (lecture hours)
   - Weekly reading assignments to prepare students for participation in class discussion.
   - Chapter homework consisting of written answers to review questions and ASE style multi-choice questions.
   - Laboratory reports on assigned tasks.

2. **EVIDENCE OF CRITICAL THINKING**
   Assignments require the appropriate level of critical thinking
   - Relate the cause and effect relationships between HC, CO and NOx.
   - Calibrate and operate exhaust gas analysers according to manufacturer's specifications.
   - Diagnose common engine malfunctions using appropriate test equipment.
   - Perform comprehensive vehicle emission tests, compare results to manufacturer’s specifications and determine necessary course of action.
   - To test a positive back pressure EGR valve, Technician A applies vacuum to the valve when the engine is warm and idling. What is likely to happen with a good valve?
     - The engine speed will drop.
     - The engine speed will rise.
     - The engine speed will stay about the same.
     - There is no way to tell ahead of time.

F. TEXTS AND OTHER READINGS (TYPICAL)

3. Other: Clean Air Car Course, Complete Student Set; Bureau of Automotive Repair, BAR Mail Room, Sacramento CA 95827

III. DESIRED LEARNING

A. **COURSE GOAL**
   As a result of satisfactory completion of this course, the student should be prepared to:
   describe the rules and regulations necessary to become a clean air technician. Perform all operational tests according to manufacturers’ and C.A.R.B. specifications and record all data using a B.A.R. 90 machine.

B. **STUDENT LEARNING GOALS**
   Mastery of the following learning goals will enable the student to achieve the overall course goal.

1. **Required Learning Goals**
   Upon satisfactory completion of this course, the student will be able to:
a. Describe and apply the rules and regulations necessary to become a qualified clean air mechanic.

b. Identify the three major sources of automotive pollution and their effect on the environment.

c. Describe how hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NOx) are formed.

d. Describe the principles governing electricity and magnetism.

e. Relate the effect of rich air/fuel mixture on fuel economy and emissions.

f. Identify and state the purpose of each component of fuel injection system.

2. Lab Learning Goals
Upon satisfactory completion of the lab portion of this course, the student will be able to:

   a. Perform inspection and maintenance procedures for all emissions related components.

   b. Demonstrate the ability to successfully complete an entire official Smog Check including the Visual Inspection, Emissions Measurement and all Functional Tests.

   c. Demonstrate the ability to diagnose the cause of an emissions failure and complete all necessary adjustments to bring systems back to compliance.

IV. METHODS OF ASSESSMENT (TYPICAL)

A. FORMATIVE ASSESSMENT

   1. Lab work is evaluated at each class meeting.

   2. Written unit examinations include essay questions.

   3. Worksheets are used to record data and compare with factory specifications.

   4. Student performance is evaluated to ensure proper problem solving techniques.

   5. Unit examinations that follow the Automotive Service Excellence (ASE) format and current B.A.R. procedures.

B. SUMMATIVE ASSESSMENT

   1. Lab work.

   2. Unit examinations that follow the Automotive Service Excellence (ASE) format and current B.A.R. procedures.