# AUTO G145: BASIC CLEAN AIR CAR COURSE

| Item | Value |
|---|---|
| Curriculum Committee Approval Date | 10/17/2023 |
| Top Code | 094800 - Automotive Technology |
| Units | 5 Total Units |
| Hours | 126 Total Hours (Lecture Hours 72; Lab Hours 54) |
| Total Outside of Class Hours | 0 |
| Course Credit Status | Credit: Degree Applicable (D) |
| Material Fee | No |
| Basic Skills | Not Basic Skills (N) |
| Repeatable | No |
| Grading Policy | Standard Letter (S) |

## Course Description

This course is required by the Bureau of Automotive Repair (BAR) to obtain an Advanced Emissions Specialist license. The course will cover rules and regulations, history of the California Smog Check Program, a study of five-gas analysis, oxygen sensors, an overview of all emission control devices offered in California since 1975 and an introduction to onboard diagnostics second generation (OBD ll). The theory in this course is reinforced with hands-on skill practice. Students must complete this course before submitting an application to the BAR for an Advanced Emissions Specialist license. Transfer Credit: CSU.

## Course Level Student Learning Outcome(s)

1. Course Outcomes
2. Analyze automotive engines and related components for correct system operation.
3. Use diagnostic tools and equipment for automotive repair.
4. Analyze five gas exhaust emissions.

## Course Objectives

- 1. Describe Bureau of Automotive Repair (BAR) rules and regulations.
- 2. Evaluate oxygen sensor signals and feedback systems.
- 3. Analyze diagnostic trouble codes and freeze frame data to determine root cause of emissions failures.
- 4. Evaluate five-gas exhaust samples and make repairs that reduce harmful emissions.
- 5. Perform a 50/15 and 25/25 Acceleration Simulation Mode (ASM) test on BAR approved test equipment.

## Lecture Content

Safety Basic auto technology shop safety and demonstrations BAR 97 dyno safety OIS gas safety Rules and Regulations Legal cost of repair estimates Work order signature compliance License renewal Repair procedures for compliance Referrals to other businesses Bureau actions against license Multiple shop ownership Records management Administrative overview, Inspector or Repair Star test only Star test and repair Test only Test and repair Repair only Referee Requirements Smog Check and Consumer Estimate Work on vehicles Write it right Smog check Visual smoke test and failure consumer information Smog check repairs during inspections Smog check repairs for failed vehicles Vehicle inspection report Consumer Assistance Program (CAP) Repair cost waiver State referee services Emission Testing Acceleration Simulation Mode (ASM) 1976-1999 50/15 and 25/25 Emissions testing automatic/manual, TSI 2500rpm 30 secs Functional checks Technician Performance Evaluation Inspection quality Low Pressure Fuel Evaporative Testing (LPFET) Ignition timing light operation and testing Fuel cap Test deviations Catalytic Converter Inspection verification Labeling Aftermarket/arb.ca Executive Order (EO) Emissions related components category input Catalytic converter replacement criteria OBD II monitors and mode 6 OIS Emissions Control Inspections Identify missing, modified, disconn ected, and defective devices Perform visual inspections of emission control systems Perform functional tests on exhaust gas recirculation system (EGR), ignition timing, fill pipe restrictor, and malfunction indicator light (MIL) Positive Crankcase Ventilation (PCV) Throttle Actuator Control (TAC) Spark Controls Secondary Air Injection (AIR) Evaporative Emissions Control System (EVAP) Smoke Test Smog: Cause and Effect Combustion process Formation and effects of carbon monoxide (CO) Formation and effects of hydrocarbons (HC) Formation and effects of oxides of nitrogen (NOx) Federal and state efforts to control air pollutants from vehicles Theory, Operation, Testing, and Inspection of the following systems: Positive crankcase ventilation Evaporative control Air injection Exhaust gas recirculation Spark control Catalytic converter (2-way and 3-way) Air induction pre-heat Gas Analysis Stoichiometric air/fuel ratio Components and operation of a gas analyzer HC emissions and the relationship to engine performance CO emissions and the relationship to engine performance Carbon dioxide (CO2) emissions and the relationship to engine performance Oxygen (O2) content in the exhaust and the relationship to engine performance NOx emissions and the relationship to engine performance Relationship of exhaust gasses to one another and stoichiometric air/fuel ratio Troubleshooting using a gas analyzer Inspection Procedures Vehicle identification Technician access Vehicle identification information Emissions measurement tests Before test condit ions Acceleration Simulation Mode (ASM) emissions inspection Two-speed idle Emission test abort conditions Visual inspection Emission control inspection Emission control system label BAR referee label Aftermarket parts label Visual inspection definitions Tampered Missing Modified Disconnected Defective Emission control functional tests Functional test application Malfuntion indicator light Onboard diagnostics second generation (OBD II) functional test Ignition timing test EGR test Fuel Cap integrity test Low pressure fuel evaporative test (LPFET) Regulations Tester initialization Performing the test Key milestones Vehicles likely to be exempted from LPFET Smog check inspection results Vehicle inspection report Vehicle passes smog check Vehicle fails smog check Repair data Repair information entry Miscellaneous Test restrictions for directed vehicles Gross vehicle weight rating Pre-inspection mode Pre-inspection repair Program Description Program overview Station Definitions Station licensing requirements Equipment requirements Equiqment maintenance Licensed technician requirements Station operation Station audits Repair assistance Cost waivers Customer authorization Inspection scenarios Repair and Retest Procedures Vehicle repair standards Vehicle warranty BAR Referee Refere e inspection services Referee appointment BAR Referee label Onboard Diagnostics Second Generation (OBD II) Evolution of onboard diagnostics Onboard diagnostics terminology and communication OBD II system monitor Diagnostic trouble codes and scan tools Diagnostic troubleshooting routines Performing specific manufacturers diagnostic routines Component testing

## Lab Content

Using available service information, locate emission control systems and timing specifications for selected vehicles and record results. Conduct complete visual inspections on four selected vehicles and record results. Perform a ASM smog inspection on four vehicles and record results. Perform a two-speed idle test on 4 vehicles and record results. Retrieve diagnostic trouble codes and freeze frame data using various scan tools. Analyze and interpret results. Erase codes. Test an oxygen sensor and feedback system using a digital storage oscilloscope. Test a catalytic converter using a pyrometer, propane enrichment, oxygen storage indicators, and other methodology. Conduct the (LPFET) on two vehicles. Use vacuum gauge to test engine condition and check for restricted exhaust. Test EGR system using conventional tools. Perform manufacturer specific diagnostic routines.

## Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- Lab (04)
- DE Live Online Lab (04S)

## Reading Assignments

TextWebsitesBAR Student Workbook and websitesSmog Check Inspection Procedures ManualSmog Check Reference Guide

## Writing Assignments

Prepare for written tests through careful reading of assigned texts. Use critical thinking to analyze vehicle emissions systems, evaluate information, determine root cause, and perform repairs to reduce harmful emissions. Use lab scopes, gas analyzers, service information and other equipment to gather critical information and make diagnostic decisions.

## Out-of-class Assignments

Readings Interactive web based modules

## Demonstration of Critical Thinking

Diagnose emissions related concerns based on information gathered from test equipment, service information and other sources. Determine cause and effect, root cause, relationships of all data and make repairs that reduce harmful emissions.

## Required Writing, Problem Solving, Skills Demonstration

Prepare for written tests through careful reading of assigned texts. Use critical thinking to analyze vehicle emissions systems, evaluate information, determine root cause, and perform repairs to reduce harmful emissions. Use lab scopes, gas analyzers, service information, and other equipment to gather critical information and make diagnostic decisions.

## Eligible Disciplines

Automotive technology: Any bachelors degree and two years of professional experience, or any associate degree and six years of professional experience.

## Textbooks Resources

1. Required James D. Halderman. Automotive Electrical and Engine Performance, 8th ed. Pearson, 2020 Rationale: .

## Other Resources

1. Websites 2. Laws and Regulations Manual 3. Write it Right Booklet 4. Smog Check Manual 5. Smog Check Reference Guide 6. Hybrid Vehicle Inspections