

**LONG BEACH CITY COLLEGE
AUTO MECHANICS 440
AUTOMOTIVE COMPUTER &
ADVANCED EMISSION CONTROLS
SPRING 2009 – SECTION # 34619**

SUBJECT MATTER AREA	Automotive Technology
COURSE NUMBER	AMECH 440
SECTION NUMBER	34619
ROOM #	MM130
COURSE TITLE	Auto Computer & Advanced Emission Controls
UNITS	6.0
DAYS/HOURS	T-Th 6:00P - 10:00P
INSTRUCTOR	Pete Sparks
OFFICE	MM130C
PHONE	(562) 938-3005
OFFICE HOURS	T-Th 5:30P - 6:00P
PREREQUISITE	1. High school auto or AMECH 421 (Recommended – not required) 2. AMECH 438 recommended (not required) 3. AMECH 233 or AMECH 432 & 444 recommended (not required)

Anyone may take this course for school credit toward graduation. In order to receive BAR Certificates of Completion, you must have completed prior to the start of this class one year of trade experience or 9 semester units in tune-up & emissions related subjects (Automotive Fuel Systems and Automotive Electrical Systems offered at LBCC recommended). A combination of both is also acceptable but subject to approval. Classes taken at other schools may be substituted based on department approval.

COURSE LENGTH	1/12/2009 – 5/19/2009 (18 weeks)
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FINAL EXAM DATE	5/19/2009 (TUE 6:00 PM)
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CATALOGUE DESCRIPTION	Covers the California State approved "Advanced Clean Air Courses" as well as preparation for the California Inspection and Maintenance Emission Control License (Enhanced Area). Also, covers operation and testing of computer-controlled oxygen feedback systems and use of the California State approved Emissions Inspection Systems (EIS).
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TEXTBOOKS

Dr. Smog's Advanced OBD II Diagnosis (Supplied)
BAR97 Transition Course Booklet (Supplied)
BAR97 Update Course Booklet Modules (Supplied)
2007 Update Course Booklet (Supplied)
2009 Update Course Booklet (Supplied)

OBJECTIVES

This program is structured to meet ASE/NATEF requirements in the A8 Engine Performance program area and the A8 task list will be applied and utilized (see end of syllabus for task list). This course is a BAR97/2005 certified multi-part training program and includes the most recent required BAR Update Course. This program is offered in accordance with the requirements as laid forth in the latest Smog Check program which has been implemented in full by the State of California. Although this class is open to anyone who wishes to take the class for a grade, there are specific requirements that MUST be met in order to obtain a BAR Completion Certificate for each section completed (replaces page four of the Smog Check License application). Successfully completing all four portions of this program entitles you to the following:

- Certificate of Completion for the 28 hour "Advanced Clean Air Car Course" which includes the BAR97-Transition 8 hour course, to certify you in the basic operations of the BAR97 Emissions Inspection System and dynamometer, an introduction to NOx and baseline diagnostics, and the 20 hour BAR97 Update Course, which is required to apply for the Enhanced Area Smog Check license.
- Certificate of Completion for the BAR 2007 12 hour Update course which is required for all current and new licensees.
- Certificate of Completion for the BAR 2009 16 hour Update course which is required for all current and new licensees.

You may choose to complete this course solely for a grade but are encouraged to pursue the certifications as this course satisfies all three requirements for the Smog Check License. In order to apply for the Smog Check License you must also hold current certification in the ASE A6, A8 and L1 exams or their equivalents. Other requirements will be discussed in the first few class sessions.

METHODOLOGIES

This class will consist of approximately 60% lecture and 40% laboratory assignments. Lab time will consist of instructor led demonstrations and hands-on student participation. You will be evaluated on your abilities to learn and apply procedures and data.

EVALUATION CRITERIA

Your grades will be based on the following:
Computer Controls Mid-term (50 points)
BAR97T Exam (25 points)
BAR97 Update Exam (50 points)
BAR 2007 Exam (50 points)
BAR 2009 Exam (50 points)
Attendance & Class participation (25 points)
Total points possible = 250

GRADING

A	90 – 100%
B	80 – 89%
C	65 – 79%
D	50 – 64%
F	0 – 49%

Note: Students whose attendance and class participation is excellent will receive consideration if their grade percentage falls between cut points. Students who miss more than 10% of the class meetings will have their grade reduced by 10%. **Students who miss more than 20% of class meetings will be automatically dropped (example: missing one day every two weeks or more than 7 days). Class begins promptly at 6:00 p.m. If you are tardy past 6:15 p.m. you **WILL** be counted absent.**

SHOP SUPPLIES AND DRESS

Students are expected to dress appropriately to work safely in a shop environment. SAFETY GLASSES are **MANDATORY** and should be worn **AT ALL TIMES** while in the shop. Shop towels will not be provided. Open toed shoes or sandals will not be allowed.

HOLIDAY SCHEDULE

Thur 1/29/2009 – Flex Day
Mon - Fri 4/13/2009 - 4/17/2009 – Spring Recess

AMECH 440 COURSE OUTLINE

1. Introductions
 - a. Introduction to automotive computer & emission controls
 - b. Textbook overview and ordering instructions
 - c. Course syllabus introduction
 - d. Explanation of course syllabus
 - e. Grading explanation
2. Safety
 - a. Personal safety issues
 - b. Shop safety issues
 - c. Hazardous materials
 - d. Combustible materials
 - e. Safety in the workplace
 - f. Safety quiz (mandatory)
3. Basic Theories
 - a. Introduction
 - b. Review of Basic Electricity
 - c. Review of Electronics
 - d. Work, Force & Energy
 - e. Energy Conversion
 - f. Liquids, Gasses & Atmospheric Pressure
 - g. Vacuum & Manifold Pressure
4. Computer Feedback Systems
 - a. Theory of operation
 - b. Inputs & Outputs
 - c. Diagnosis & Repair
 - d. Troubleshooting Techniques
5. BAR97 Transition Course – Dynamometer Safety Training & Introduction to NOx Emissions (8 hours min.)
6. BAR97 Update Course – Advanced Emissions Testing & Diagnosis (20 hours min.)
7. Update 2007 Course – Advanced OBD II (Mode 6) Diagnostics (12 hours min.)
8. Update 2009 Course – CAN System, Electronic Throttle Control, Internet Usage and Advanced Emission Diagnosis (16 hours min.)

NATEF TASK LIST FOR ENGINE PERFORMANCE A8

For every task in Engine Performance the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

VIII. ENGINE PERFORMANCE	Priority	Date Completed
A. General Engine Diagnosis		
1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	P1	
2. Identify and interpret engine performance concern; determine necessary action.	P1	
3. Research applicable vehicle and service information, such as engine management system operation, vehicle service history, service precautions, and technical service bulletins.	P1	
4. Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals).	P1	
5. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.	P2	
6. Diagnose abnormal engine noise or vibration concerns; determine necessary action.	P2	
7. Diagnose abnormal exhaust color, odor, and sound; determine necessary action.	P2	
8. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.	P1	
9. Perform cylinder power balance test; determine necessary action.	P1	
10. Perform cylinder cranking compression tests; determine necessary action.	P1	
11. Perform engine running compression test; determine necessary action.	P2	
12. Perform cylinder leakage test; determine necessary action.	P1	
13. Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns with an oscilloscope and/or engine diagnostic equipment; determine necessary action.	P1	
14. Prepare 4 or 5 gas analyzer; inspect and prepare vehicle for test, and obtain exhaust readings; interpret readings, and determine necessary action.	P1	

15. Verify engine operating temperature; determine necessary action.	P1	
16. Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action	P1	
17. Verify correct camshaft timing.	P2	
B. Computerized Engine Controls Diagnosis and Repair		
1. Retrieve and record stored OBD I diagnostic trouble codes; clear codes.	P3	
2. Retrieve and record stored OBD II diagnostic trouble codes; clear codes when applicable.	P1	
3. Diagnose the causes of emissions or driveability concerns resulting from malfunctions in the computerized engine control system with stored diagnostic trouble codes	P1	
4. Diagnose emissions or driveability concerns resulting from malfunctions in the computerized engine control system with no stored diagnostic trouble codes; determine necessary action.	P1	
5. Check for module communication (including CAN/BUS systems) errors using a scan tool.	P2	
6. Inspect and test computerized engine control system sensors, powertrain control module (PCM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO); perform necessary action.	P1	
7. Obtain and interpret scan tool data.	P1	
8. Access and use service information to perform step-by-step diagnosis.	P1	
9. Diagnose driveability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM-installed accessories, or similar systems); determine necessary action.	P1	
10. Perform active tests of actuators using scan tool; determine necessary action.	P1	
C. Ignition System Diagnosis and Repair		
1. Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns on vehicles with electronic ignition (distributorless) systems; determine necessary action.	P1	
2. Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns on vehicles with distributor ignition (DI) systems; determine necessary action.	P1	

3. Inspect and test ignition primary circuit wiring and solid state components; perform necessary action.	P2	
4. Inspect, test and service distributor.	P3	
5. Inspect and test ignition system secondary circuit wiring and components; perform necessary action.	P-2	
6. Inspect and test ignition coil(s); perform necessary action.	P-1	
7. Check and adjust ignition system timing and timing advance/retard (where applicable).	P-3	
8. Inspect and test ignition system pick-up sensor or triggering devices; perform necessary action.	P-1	
D. Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair		
1. Diagnose hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems on vehicles with injection-type fuel systems; determine necessary action.	P-1	
2. Check fuel for contaminants and quality; determine necessary action.	P-3	
3. Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action.	P-1	
4. Replace fuel filters.	P1	
5. Inspect and test cold enrichment system and components; perform necessary action.	P3	
6. Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.	P2	
7. Inspect and test fuel injectors.	P1	
8. Check idle speed.	P2	
9. Inspect the integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shield(s); perform necessary action.	P2	
10. Perform exhaust system back-pressure test; determine necessary action.	P1	
11. Test the operation of turbocharger/supercharger systems; determine necessary action.	P3	
E. Emissions Control Systems Diagnosis and Repair		
1. Positive Crankcase Ventilation		
1. Diagnose oil leaks, emissions, and driveability problems resulting from malfunctions in the positive crankcase ventilation (PCV) system; determine necessary action.	P2	
2. Inspect, test and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.	P2	

2. Exhaust Gas Recirculation		
1. Diagnose emissions and driveability problems caused by malfunctions in the exhaust gas recirculation (EGR) system; determine necessary action.	P1	
2. Inspect, test, service and replace components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters and hoses; perform necessary action.	P1	
3. Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action.	P2	
3. Exhaust Gas Treatment		
1. Diagnose emissions and driveability problems resulting from malfunctions in the secondary air injection and catalytic converter systems; determine necessary action.	P2	
2. Inspect and test mechanical components of secondary air injection systems; perform necessary action.	P3	
3. Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action.	P3	
4. Inspect and test catalytic converter performance.	P1	
4. Evaporative Emissions Controls		
1. Diagnose emissions and driveability problems resulting from malfunctions in the evaporative emissions control system; determine necessary action.	P1	
2. Inspect and test components and hoses of evaporative emissions control system; perform necessary action.	P2	
3. Interpret evaporative emission related diagnostic trouble codes (DTCs); determine necessary action.	P1	
F. Engine Related Service		
1. Adjust valves on engines with mechanical or hydraulic lifters.	P1	
2. Remove and replace timing belt; verify correct camshaft timing.	P1	
3. Remove and replace thermostat and gasket.	P1	
4. Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.	P1	
5. Perform common fastener and thread repairs to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.	P1	
6. Perform oil and filter change.	P1	
7. Demonstrate proficiency in using oxy-acetylene torch to heat and cut metal.	P3	
8. Identify hybrid vehicle internal combustion engine service precautions.	P3	