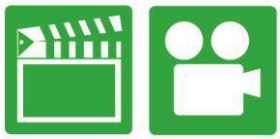
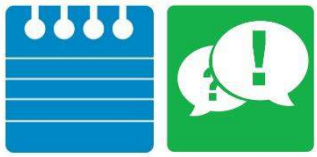
Automotive Electrical & Engine Performance 7/E

Chapter 27 ON-BOARD DIAGNOSIS

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	**This course or class covers Automotive Electrical & Engine Performance. It correlates material to task lists specified by ASE and NATEF.**
Motivate Learners	Explain how the knowledge of how something works translates into the ability to use that knowledge to figure why the engine does not work correctly and how this saves diagnosis time, which translates into more money.
State the learning objectives for the chapter or course you are about to cover and explain this is what they should be able to do as a result of attending this session or class.	Explain the chapter learning objectives to the students. 1. Understand the purpose and function of on-board diagnostics generation-II (OBD-II) systems. 2. List the continuous and non-continuous monitors. 3. Understand the information obtained from an on-board diagnostics monitor and the criteria to enable an OBD monitor. 4. Discuss the numbering designation of OBD-II diagnostic trouble codes. 5. Explain powertrain control module (PCM) tests and the modes of operation of OBD-II vehicles.
Establish the Mood or Climate	Provide a *WELCOME,* Avoid put downs and bad jokes.
Complete Essentials	Restrooms, breaks, registration, tests, etc.
Clarify and Establish Knowledge Base	Do a round robin of the class by going around the room and having each student give their backgrounds, years of experience, family, hobbies, career goals, or anything they want to share.

NOTE: This lesson plan is based on Automotive Electrical & Engine Performance 7/E Chapter Images found on Jim's web site @ www.jameshalderman.com
LINK CHP 27: Chapter Images

ICONS	Ch27 ON-BOARD DIAGNOSIS
	**1. SLIDE 1 CH27 ON-BOARD DIAGNOSIS**
	**Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/** **WEB SITE REGULARLY UPDATED**
	**NO VIDEOS THIS CHAPTER GOTO WWW.YOUTUBE.COM**
	**At the beginning of this class, you can download the crossword puzzle & Word Search from the links below to familiarize your class with the terms in this chapter & then discuss them**
	**Crossword Puzzle (Microsoft Word) (PDF)** **Word Search Puzzle (Microsoft Word) (PDF)**
	2. **SLIDE 2 EXPLAIN Figure 27-1** typical malfunction indicator lamp (MIL) often labeled “check engine” or “service engine soon” (SES).
	**DEMONSTRATION: CONNECT A SCAN TOOL TO OBD-II VEHICLE & SHOW STUDENTS HOW TO ACCESS MONITOR STATUS. THEN DEMONSTRATE COMPREHENSIVE COMPONENT MONITOR OPERATION BY DISCONNECTING A SENSOR SUCH AS ENGINE COOLANT TEMPERATURE WITH THE KEY ON. SHOW ILLUMINATED MIL & STORED DTC.FIGURE 27-1**
	**DISCUSSION: HAVE STUDENTS TALK ABOUT PURPOSE OF ONBOARD DIAGNOSTIC SYSTEMS. HOW DID COMPUTER CONTROL SYSTEMS FUNCTION PRIOR TO OBD-I? HAVE THE STUDENTS DISCUSS OBD-I. WHAT WERE SOME OF SHORTCOMINGS/PROBLEMS OF OBD-I?**
	**EXPLAIN** On-Board Diagnostics Generation-II (OBD-II) Systems **EXPLAIN** Diagnostic Executive and Task Manager

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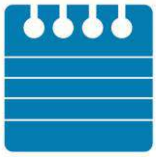
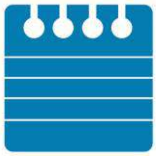
	**HANDS-ON TASK:** HAVE THE STUDENTS LOCATE THE **DIAGNOSTIC LINK CONNECTOR (DLC)** ON SEVERAL OBD-I VEHICLES USING COMPONENT LOCATORS. ASK STUDENTS TO COMPARE VARIOUS LOCATIONS TO STANDARDIZED LOCATIONS ON AN OBD-II VEHICLE
	**ON-VEHICLE NATEF TASK** LOCATE AND INTERPRET VEHICLE AND MAJOR COMPONENT IDENTIFICATION NUMBERS; DIAGNOSE CAUSES OF EMISSIONS OR DRIVEABILITY CONCERNS WITH STORED OR ACTIVE DTCS; OBTAIN, GRAPH, & INTERPRET SCAN TOOL DATA: DESCRIBE IMPORTANCE OF RUNNING ALL **OBDII MONITORS** FOR REPAIR VERIFICATION
	**EXPLAIN** Monitors **EXPLAIN** OBD-II Monitor Information
 	**DISCUSSION:** HAVE THE STUDENTS DISCUSS EXAMPLES OF **OBD-II MONITORS** AND HOW THEY OPERATE. WHAT IS A MONITOR? CERTAIN 1996 & 1997 OBD-II VEHICLES COULD SET A MISFIRE DTC FROM OPERATION ON ROUGH ROADS. **MISFIRE MONITOR** WAS VERY SENSITIVE ON THESE VEHICLES & COULD MISINTERPRET SLIGHT CRANKSHAFT SPEED VARIATIONS CAUSED BY ROUGH ROADS AS IGNITION MISFIRES
	**DEMONSTRATION:** DEMONSSTRATE OPERATION OF **MISFIRE MONITOR** BY CLOSING ELECTRODE GAP ON SPARK PLUG AND OPERATING THE ENGINE. ONCE MISFIRE HAS BEEN DETECTED, CONNECT SCAN TOOL & SHOW DTC
	DEPENDING ON PCM'S DETERMINATION OF MISFIRE'S SEVERITY, MISFIRE MONITOR MAY SET PENDING CODE UNTIL IGNITION IS CYCLED OFF & ENGINE IS OPERATED 2ND TIME. AFTER 2ND FAILURE, MATURED DTC SETS, WITH MIL ON

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	**EXPLAIN** ENABLING CRITERIA
	**DISCUSSION:** DISCUSS **ENABLING CRITERIA** AND WHY THEY ARE IMPORTANT. WHAT ARE CONDITIONS THAT MUST BE MET FOR EACH MONITOR TO RUN?
	**DISCUSSION:** DISCUSS CRITERIA FOR A **TRIP** AND WHY THEY ARE IMPORTANT FOR THE OBD-II SYSTEM. WHAT IS A TRIP?
	**DISCUSSION:** HAVE THE STUDENTS TALK ABOUT **DRIVE CYCLES.** WHAT IS A DRIVE CYCLE AND HOW DOES IT DIFFER FROM A TRIP?
	**ANIMATION: DTC EXPLAINED WWW.MYAUTOMOTIVELAB.COM** HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYAUTOMOTIVELAB_2/ANIMATIONS/A16_ANIMATION/CHAPTER54_FIG_54_2/INDEX.HTM
	**DISCUSSION:** HAVE STUDENTS DISCUSS **NUMBERING OF DTCS.** WHAT ARE MAJOR CATEGORIES OF OBD-II DESIGNATED DTCS? EXPLAIN NUMBERING FOR OBD-II DTCS & GIVE SOME EXAMPLES & EXPLANATIONS (E.G., P0301-CYLINDER #1 MISFIRE DETECTED; P0441-INCORRECT EVAPORATIVE PURGE FLOW DETECTED) **FIGURE 27-2**
	3. **SLIDE 3 EXPLAIN Figure 27-2** OBD-II DTC identification format. **EXPLAIN** OBD-II DTC Numbering Designation
	**ON-VEHICLE NATEF TASK** RETRIEVE AND RECORD DIAGNOSTIC TROUBLE CODES, OBD MONITOR STATUS, AND FREEZE FRAME DATA; CLEAR CODES WHEN APPLICABLE
	**ON-VEHICLE NATEF TASK** DIAGNOSE EMISSIONS OR DRIVEABILITY CONCERNS **W/O STORED DIAGNOSTIC TROUBLE CODES;** DETERMINE NECESSARY ACTION
	**EXPLAIN** OBD-II Freeze-Frame

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	**EXPLAIN CHART 27–1** PCM Determination of Faults Chart
	**DISCUSSION: HAVE THE STUDENTS TALK ABOUT TYPES OF DTCS. HOW ARE OBD-II DTCS CLASSIFIED FOR IMPORTANCE? CHART 27-1**
	**DISCUSS FREQUENTLY ASKED QUESTION**
	**DEMONSTRATION: CREATE A ONE-TRIP FAILURE OF A TWO-TRIP CODE; FOR EXAMPLE, CREATE A TYPE B MISFIRE BY CLOSING SPARK PLUG ELECTRODES & OPERATING ENGINE ONE TIME. SHOW STUDENTS HOW TO FIND PENDING DTCS WITH SCAN TOOL CHART 27-1**
	**DISCUSSION: HAVE THE STUDENTS DISCUSS PENDING CODES. WHAT ARE PENDING CODES AND WHERE ARE THEY STORED?**
	**HANDS-ON TASK: HAVE THE STUDENTS CREATE PENDING DTCS ON LAB VEHICLES THEIR OWN CARS. HAVE THEM RETRIEVE THE PENDING CODES AND FREEZE-FRAME DATA.**
	**EXPLAIN ENABLING CONDITIONS OR CRITERIA** **EXPLAIN** PCM Tests
	**DISCUSSION: DISCUSS PCM TESTS.** **WHAT IS RATIONALITY TESTING?** **WHAT IS FUNCTIONALITY TESTING?**
	**DEMONSTRATION: ON OBD-II VEHICLE DISCONNECT A SENSOR, SUCH AS A COOLANT TEMPERATURE SENSOR, TO SHOW STUDENTS HOW PCM TESTS FUNCTIONALITY. SHOW STUDENTS DTC AND CREATE AN OPPOSING DTC BY SHORTING CONNECTOR TERMINALS TOGETHER.**

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	EXPLAIN GLOBAL OBD-II
	DISCUSS FREQUENTLY ASKED QUESTION